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FINAL Field Sampling Plan

Stimson Spur
Test Pit Soil Sampling
Libby Asbestos Site, Operable Unit 6
Libby, Montana

April 2017

Prepared for

BNSF Railway Company
800 North Last Chance Gulch, Suite 101
Helena, MT 59601

K/J Project No. 1749206.00

Section A: Project Management

A.1 Title and Approval Sheet

Title: Stimson Spur Test Pit Soil Sampling Field Sampling Plan, Libby Asbestos Site, Operable Unit 6, Revision 1, 04/07/2017.

Reviewed by: _____ Date: 7 April 2017
Scott Carney
Kennedy/Jenks Consultants Project Manager

Reviewed by: _____ Date: 4/11/2017
Yueh Chuang, P.E.
BNSF Railway Company Manager Environmental Remediation

Approved by: _____ Date: 4/7/2017
Dania Zinner
EPA Region VIII Operable Unit 6 Remedial Project Manager

Approved by: _____ Date: 4/11/2017
David Berry
EPA Region VIII Quality Assurance Reviewer

A.2 Table of Contents

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Acronyms and Abbreviations

%	percent
A&E	architect and engineering
ABS	activity-based sampling
bgs	below ground surface
BNSF	BNSF Railway Company
CB&I	CB&I Federal Services
CDM Smith	CDM Federal Programs Corporation
COR	Contracting Officer Representative
DEQ	Montana Department of Environmental Quality
DQO	data quality objective
EC	BNSF's Environmental Consultant (Kennedy/Jenks Consultants)
EPA	U.S. Environmental Protection Agency
f/cc	fiber per cubic centimeter
FPM	field planning meeting
FSDS	field sampling data sheet
FSP	field sampling plan
FTL	Field Team Leader
GIS	geographic information system
GPS	global positioning system
H&S	health and safety
HSP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
ID	identifier
IDW	investigation-derived waste
LA	Libby amphibole asbestos
LCPA	Lincoln County Port Authority
MP	milepost
OSHA	Occupational Safety and Health Administration
OTS	Olympus Technical Services
OU	operable unit
PEL	permissible exposure limit
PLM	polarized light microscopy
PLM-Grav	polarized light microscopy – gravimetric method
PLM-VE	polarized light microscopy – visual area estimation
PPE	personal protective equipment
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control

Acronyms and Abbreviations

RAL	remedial action level
ROD	record of decision
RPM	Remedial Project Manager
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure
SPF	soil preparation facility
TC	transportation corridor
USACE	U.S. Army Corps of Engineers
USDOT	United States Department of Transportation
VV	visible vermiculite

A.3 Distribution List

Copies of this completed and signed field sampling plan (FSP) will be distributed to:

U.S. Environmental Protection Agency, Region VIII
1595 Wynkoop Street (8EPR-SR)
Denver, Colorado 80202-1129

- Dania Zinner, Dania.Zinner@epa.gov (electronic copy)

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Libby, MT 59923

- Brett McCully, Brett@krdc.net (electronic copy)

Montana Department of Environmental Quality
P.O. Box 200901
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16194 West 45th Drive
Golden, Colorado 80403

- Doug Kent, Kent.Doug@epa.gov (electronic copy)

CDM Smith, Libby Project Office
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- Thomas Cook, cookTE@cdmsmith.com (electronic copy)
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Whitefish, MT 59937

- Scott Carney, ScottCarney@KennedyJenks.com (electronic copy)
- Lauren Knickrehm, LaurenKnickrehm@KennedyJenks.com (electronic copy)

On behalf of the BNSF Railway Company (BNSF) and the Lincoln County Port Authority (LCPA), copies of the FSP will be distributed to the individuals above by the environmental consultant (EC) (Kennedy/Jenks Consultants) in electronic format (as indicated above). The EC's Project Manager (or their designee) will distribute updated copies each time a FSP

revision occurs. An electronic copy of the final, signed FSP (and subsequent revisions) will also be posted to the Libby Operable Unit 6 (OU6) eRoom.

A.4 Project Task Organization

Figure A-1 of the *Final Quality Assurance Project Plan (Revision 1)* (QAPP) (Kennedy/Jenks Consultants 2016) presents an organizational chart that shows lines of authority and reporting responsibilities for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, technical support, and quality assurance (QA) for this project.

A.4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within the Libby Asbestos Superfund Site (Site). The EPA Remedial Project Manager (RPM) for OU6 is Dania Zinner.

The U.S. Army Corps of Engineers (USACE), Omaha District, provides project oversight, on behalf of the EPA. The USACE has an interagency agreement number with the EPA, number DW96958550, through which the USACE oversight work will be performed. USACE's Project Manager and Contracting Officer Representatives (CORs) are Mary Darling and Mark Meacham, respectively.

The Montana Department of Environmental Quality (DEQ) is the support regulatory agency for Superfund activities at the Site. The DEQ Project Manager for these activities is Lisa Dewitt. The EPA will consult with DEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act, the National Contingency Plan, and applicable guidance in conducting Superfund activities.

BNSF owns and operates the property contained within OU6 and manages environmental remediation-related issues through their Environmental Remediation department. BNSF oversight and management of OU6 is assigned to Yueh Chuang, P.E., Manager Environmental Remediation.

LCPA is working with BNSF to improve rail access within a section of OU6 discussed below. The LCPA representative for these activities is Brett McCully, Director of Operations.

BNSF has contracted with Kennedy/Jenks Consultants to represent BNSF as the project EC and provide BNSF with FSP development and maintenance, data collection (sampling), and project management services.

A.4.2 Technical Support

A.4.2.1 FSP Development

This FSP was developed by the EC at the direction of BNSF, and with oversight by EPA. This FSP and associated QAPP are the governing documents. The QAPP, which is included in Appendix A, was developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001), *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5* (EPA 2002), and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006). Applicable portions of the QAPP are incorporated by reference in this FSP.

Copies of the FSP will be distributed by the EC's Project Manager (or their designee), in electronic format, as indicated in Section A3 - Distribution List. The EC's Project Manager (or their designee) will distribute updated copies each time a FSP revision occurs. An electronic copy of the final, signed FSP (and subsequent revisions) will also be posted to the Libby Field eRoom by the EPA (or their designee).

A.4.2.2 Field Sampling Activities

The EC will be responsible for conducting all field test pit sampling activities described in this FSP. Key EC personnel who will be involved in this test pit sampling program include:

- Scott Carney, Project Manager
- Lauren Knickrehm, Field Team Leader
- Gregg Bryden, Deonne Knill, Quality Assurance Team
- Field Sampling Team Members include Laura Klein, Kristina Kohl, Annika Silverman
- John Jindra, Health and Safety (H&S) Manager.

A.4.2.3 Asbestos Analysis

See Section A.4.2.3 of the QAPP.

A.4.2.4 Data Management

See Section A.4.2.4 of the QAPP.

A.4.3 Quality Assurance

See Section A.4.3 of the QAPP.

A.5 Problem Definition/Background

A.5.1 Site Background

Libby is a community in northwestern Montana located 7 miles southwest of a vermiculite mine that operated from the 1920s until 1990. The mine began limited operations in the 1920s and was operated on a larger scale by W.R. Grace and Company from approximately 1963 to 1990. Studies revealed that the vermiculite from the mine contains amphibole-type asbestos, referred to as Libby Amphibole asbestos (LA).

Epidemiological studies revealed that workers at the mine had an increased risk of developing asbestos-related lung disease (McDonald et al. 1986; Amandus et al. 1987; Amandus and Wheeler 1987; Sullivan 2007; Larson et al. 2010, 2012a, 2012b). Additionally, radiographic abnormalities were observed in 17.8 percent (%) of the general population of Libby including former workers, family members of workers, and individuals with no specific pathway of exposure (Peipins et al. 2003). Although the mine has ceased operations, historical or continuing releases of LA from mine-related materials could be serving as a source of ongoing

exposure and risk to current and future residents and workers in the area. The Site was listed on the National Priorities List in October 2002.

Sampling efforts began in 2001 and focused primarily on characterization of impacts in and around the BNSF Libby Railyard. Sampling efforts after response actions, which were completed at the BNSF Libby Railyard in 2004 and 2005, have primarily focused on receptor exposure during railroad maintenance activities along the tracks outside the BNSF Libby Railyard. The largest of these efforts was an activity-based sampling (ABS) event, which occurred in late 2008 in cooperation with EPA and oversight provided by CDM Federal Programs Corporation (CDM Smith). In addition, BNSF has conducted additional sampling events, beyond EPA requirements, to monitor compliance with Occupational Safety and Health Administration (OSHA) regulations.

The Stimson Spur is an industrial railroad spur located on the eastern side of the town of Libby that formerly served Stimson Lumber Yard and other local industries (Figure 1). The Stimson Spur is located on land incorporated into OU5 (Stimson Lumber Mill properties) and OU6. A portion of this spur, referred to as the West Leg of the Stimson Spur, from the east of the Libby Depot toward the Stimson Lumber Yard was demolished in 2010 (EMR 2010) (Figure 1). LCPA is working with BNSF to reinstall and reconfigure the West Leg of the Stimson Spur to improve rail access to the town of Libby. The majority of land within OU6 that will be affected by the track reinstallation was sampled in the early 2000s during soil characterization efforts related to the Libby Railyard. The test pit investigation described in this FSP will address the portion of OU6 that has not been previously characterized, herein referred to as the Investigation Area. The portions of the track reinstallation project area lying within OU5 were previously characterized under the *Operable Unit 5 Railroad Spur Investigation Quality Assurance Project Plan* (USACE 2014).

Summaries of past OU6 investigations and response actions can be found in *Final Remedial Investigation Report for Operable Unit 6 at the Libby Asbestos Site – Libby, Montana* (Kennedy/Jenks Consultants 2014) and *Final Data Summary Report Operable Unit 6 – BNSF Railyard, Track and Right-of-Way, Libby Asbestos Site, Libby, Montana* [United States Department of Transportation (USDOT) 2008]. The OU6 investigation and response action history are summarized in Table A-1.

Table A-1: Summary of Past OU6 Investigations and Response Actions

Date	Investigation Name	Location	Purpose
Pre-2005 Investigation and Response Action History			
Apr-01	Soil/Undercutter Spoils Sampling	MP 1312-1320	Characterization
Nov-01	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Oct-02	Railyard Soil Characterization Sampling	MP 1319.3-1320	Characterization
Nov-02	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Aug-03	2003 Response Action	MP 1319.3-1320	Delineation
Jul-04	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Sep-04	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Sep-Nov-04	2004 Libby Railyard Response Action	MP 1319.3-1320	OSHA, Clearance
Nov-05	2005 Libby Railyard Response Action	MP 1319.3-1320	OSHA, Clearance
Post-2005 Investigation History			
Jul-08	Rail Crossing Air Monitoring Report	MP 1321.8, MP 1324.3	OSHA
Sep-08	BNSF OSHA Exposure Sampling Summary Report - Steel Gang	MP 1312-1341	OSHA
Sep-08	Activity Based Sampling Summary Report - Public Receptors	MP 1312-1341	ABS Delineation
Sep-08	Activity Based Sampling Summary Report - Worker Receptors	MP 1312-1341	ABS
May-09	BNSF Personnel OSHA Exposure Sampling Report - Supersurfacing Gang	OU6	OSHA
Jun-09	BNSF Undercutter Spoils Sampling Report	MP 1329.8-1333.02	Characterization
Mar-10	BNSF Asbestos Exposure Sampling Report - Steel Gang	MP 1308.5-1344	OSHA
May-10	BNSF Asbestos Exposure Sampling Report - Stimson Wye Removal	MP 1319.41 to 3rd Street terminus	OSHA
Sep-11	BNSF Personnel OSHA Exposure Sampling Report	MP 1313-1342.1	OSHA
Aug-Sep-16	BNSF Confirmation Soil Sampling	MP 1301-1342	Confirmation

Notes:
MP – milepost
OSHA – Occupational Safety and Health Administration
ABS – activity-based sampling

A.5.2 Project Rationale

BNSF and the LCPA are working together to improve rail access to the Stimson Spur in an effort to encourage development of the former Stimson Lumber property (Figure 1). According to information provided by LCPA, the West Leg of the Stimson Spur will be reconstructed and realigned to lessen track curvature. The proposed track alignment will intersect the Investigation Area, which is BNSF-owned property that has not been previously sampled. This investigation

will be conducted to satisfy BNSF requirements for construction and lease development and is not being mandated by the EPA or DEQ. However, the sampling strategy and procedures will follow Libby-specific procedures and methodologies, adopted for application in OU6.

Physical cleanup of LA-contaminated soils has been completed within OU6 by BNSF, specifically within the BNSF Libby Railyard, which is adjacent to the Investigation Area. Subsequent ABS investigations and confirmation soil sampling have been conducted in OU6 and support the conclusion that these removal actions were effective in mitigating LA exposures (CDM 2015, Section 8.2.3). Additional physical cleanups are not likely in OU6 unless the Transportation Corridor remedial action level (TC RAL) is exceeded. The TC RAL, applicable to OU6, is defined as an LA concentration of Bin C by polarized light microscopy - visual estimation (PLM-VE) and PLM-Gravimetric (PLM-Grav) (i.e., LA is present at levels greater than or equal to 1%) (EPA 2016).

Therefore, the two primary objectives of this test pit investigation are to:

1. Collect soil data to confirm the presence or absence of LA in the Investigation Area soils.

2. Compare LA concentrations in soil, collected as part of this test pit investigation, to the TC RAL, to determine if physical cleanup actions will be required prior to construction.

The extent of the Investigation Area is shown on Figure 2.

A.5.3 Applicable Criteria and Action Limits

The EPA has developed a RAL for contaminated soils that are applicable to removal actions performed within transportation corridors (OU6 and OU8). The TC RAL defines the condition when remedial action is and is not needed for LA contamination in soil (EPA 2016). The TC RAL for LA contamination in surface soils is a LA soil concentration of Bin C by PLM-VE/PLM-Grav, or LA is present at concentrations greater than or equal to 1%. RALs are defined in *Record of Decision for Libby Asbestos Superfund Site – Libby and Troy Residential and Commercial Properties, Park and Schools, Transportation Corridors, and Industrial Park, Operable Units 4 through 8, Lincoln County, Montana* (ROD) (EPA 2016).

OSHA has developed short-term and long-term limits for workplace exposures to asbestos in air. The short-term (30-minute) exposure limit is 1.0 fiber per cubic centimeter (f/cc) of air, and the long-term time-weighted average exposure limit is 0.1 f/cc. Personal air monitoring of sampling personnel will not be conducted during the test pit investigation based on the negative exposure results of personal air sampling completed during the 2016 Confirmation Sampling. All sampling personnel will wear Level D personal protective equipment (PPE), modified to include respiratory protection.

A.6 Project/Task Description

A.6.1 Task Summary

Basic tasks required to implement this FSP include the collection of two 30-point composite samples from six test pits as shown on Figure 2. Soils will be removed from each of the six test pits to a depth of 36 inches. Excavated soils will be placed into one of two stockpiles, one consisting of soils excavated between the ground surface and approximately 18 inches below

ground surface (bgs) and a second stockpile consisting of soils excavated from between approximately 18 inches and 36 inches bgs. Five soil subsamples (aliquots) will be collected and combined from each of six stockpiles representing soils from the ground surface to 18 inches bgs to form a 30-point composite sample. The same process will be repeated for each of the 18-inch to 36-inch bgs stockpiles. If an appreciable thickness of ballast is present on the ground surface, it will be stockpiled separately and saved to restore the Site.

Further sampling details are discussed in Section B.1.3.

A.6.2 Work Schedule

The work schedule for performing tasks associated with this FSP begins with utility locations in the investigation area and test pit location marking. It is anticipated that approximately 1 field day will be required for mobilization to the Site, utility locates, and test pit marking; and 1 day for digging the test pits, sampling, and backfilling the test pits. Sample analysis and data evaluation and interpretation tasks will be performed immediately following sample collection. It is anticipated that field work will be completed during April 2017, pending EPA approval of this document.

A.6.3 Locations to be Evaluated

The Investigation Area is located on the eastern side of the town of Libby as shown on Figure 1. The proposed test pit locations within this area are shown on Figure 2, pending clearance from utility locates.

A.6.4 Resources and Time Constraints

Tasks associated with this FSP may be conducted year-round; however, outdoor field work is limited by weather conditions and available daylight.

A.7 Quality Objectives and Criteria

A.7.1 Data Quality Objectives

Data quality objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The design of a study is closely tied to the DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and types of analyses to be performed. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a confirmation sampling program will be adequate to support reliable Site-specific decision-making (EPA 2001, 2006).

Appendix B provides the detailed implementation of the seven-step DQO process associated with this FSP.

A.7.2 Performance Criteria

The primary goal of this FSP is to provide data to determine whether LA concentrations in the Investigation Area exceed the TC RAL. Therefore, the performance criteria and analytical requirements are based on the requirements specified in the ROD (EPA 2016).

These requirements are specified as part of the DQOs (see Appendix B). The analytical requirements for LA measurements established in Section B.4 provide that results from this study will be directly comparable to results from historical and planned future sampling efforts.

A.7.3 Precision

See Section A.7.3 of the QAPP.

A.7.4 Bias and Representativeness

See Section A.7.4 of the QAPP.

A.7.5 Completeness

See Section A.7.5 of the QAPP.

A.7.6 Comparability

See Section A.7.6 of the QAPP.

A.7.7 Method Sensitivity

See Section A.7.7 of the QAPP.

A.8 Special Training/Certifications

A.8.1 Field

Asbestos is a hazardous substance that can increase the risk of cancer and serious non-cancer effects in people who are exposed by inhalation. Therefore, all individuals involved in the collection, packaging, and shipment of samples must have appropriate training. Prior to starting field work, field team members (including subcontractors) working on or adjacent to, BNSF tracks must complete the following, at a minimum:

Table A-2: Training Requirements

Training Requirement	Documentation Specifying Training Requirement Completion
Read and understand the site-specific health and safety plan (HSP)	HSP signature sheet
Attend an orientation session with the field H&S Manager	Orientation session attendance sheet
Complete OSHA 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8-hour refreshers	OSHA training certificates
Hold current 40-hour HAZWOPER medical clearance	Physician letter in the field personnel files
Complete respiratory protection training, as required by 29 Code of Federal Regulations (CFR) 1910.134	Training certificate

Training Requirement	Documentation Specifying Training Requirement Completion
Complete asbestos awareness training, as required by 29 CFR 1910.1001	Training certificate
BNSF Contractor Safety Training	Training card
BNSF Roadway Worker Protection	Training card
ERailSafe Certification	Training card

H&S-related training documentation will be stored in the EC's on-site HSP. It is the responsibility of the field H&S Manager to keep H&S-related training documentation up-to-date and on file for each field team member.

Prior to beginning field sampling activities, a field planning meeting will be conducted to discuss and clarify the following:

- Objectives and scope of the fieldwork, including subcontractor work
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- QA/quality control (QC) requirements
- H&S requirements
- On-track safety procedures.

It is the responsibility of each field team member to review and understand applicable governing documents associated with this confirmation sampling program, including this FSP, associated standard operating procedures (SOPs) (see Appendix B of the QAPP and the applicable HSP).

A.8.2 Analytical Laboratory

A.8.2.1 Certifications

See Section A.8.2.1 of the QAPP.

A.8.2.2 Laboratory Team Training/Mentoring Program

See Section A.8.2.2 of the QAPP.

A.8.2.3 Analyst Training

See Section A.8.2.3 of the QAPP.

A.9 Documentation and Records

A.9.1 Governing Document

The governing document of this investigation is the QAPP (Kennedy/Jenks Consultants 2016), which is included in Appendix A. This FSP serves as an addendum to the QAPP and incorporates, by reference, several QAPP sections.

QAPP sections that have been incorporated by reference are not included in this FSP, but cross references to the applicable QAPP sections are provided in the text of this document.

A.9.2 Field

See Section A.9.1 of the QAPP.

A.9.3 Troy Sample Preparation Facility

See Section A.9.2 of the QAPP.

A.9.4 Laboratory

See Section A.9.3 of the QAPP.

A.9.5 Logbooks and Records of Modification

See Section A.9.4 of the QAPP.

A.9.6 QAPP Revision

See Section A.9.5 of the QAPP.

Section B: Quality Assurance Project Plan

B.1. Study Design

B.1.1 Locations

Figure 1 identifies the location of the Site. Figure 2 identifies the Investigation Area and test pit locations.

B.1.2 Sampling Design

Detailed information on confirmation sampling procedures and methods are presented in Section B.2.

B.1.3 Study Variables

As per the ROD (EPA 2016), the term “surface soil” is used to describe soil that would be encountered by human receptors under “typical” activities. “Typical” track construction activities are not likely to disturb soils to a depth greater than 36 inches bgs. Therefore, test pits will be excavated to 36 inches bgs. Asbestos concentrations in surface soil can be heterogeneous; therefore, it is important that soil sampling methods provide an even and representative coverage of the Investigation Area. To accomplish the goal of characterizing soils within the Investigation Area, each composite sample will consist of 30 individual aliquots.

Details regarding sample collection are discussed further in Section B.2.2.

B.1.4 Critical Measurements

As previously mentioned, the two primary objectives of this confirmatory sampling effort are to:

1. Collect soil data to confirm the presence or absence of LA in the Investigation Area soils.

2. Compare LA concentrations in soil, collected as part of this test pit investigation, to the TC RAL, to determine if physical cleanup actions will be required prior to construction.

The analysis of LA may be achieved using several different types of methods. For this test pit investigation, all soil samples (including field duplicate samples) will be analyzed for asbestos by the PLM-VE and the PLM gravimetric method (PLM-Grav) in accordance with project-specific SOPs SRC-LIBBY-03 and SRC-LIBBY-01, respectively[1]. These methods were selected to maintain consistency with past soil sampling results, and to allow comparison to the TC RAL.

B.1.5 Data Reduction and Interpretation

Data collected as part of this test pit investigation will be compared to the TC RAL in order to appropriately address potential exposure during soil disturbing activities. See Section B.5.1.2 for

[1] The current version of each project-specific analysis SOP is provided in the Libby Lab eRoom.

information regarding the evaluation of data collected under this QAPP as it relates to the DQOs in Appendix B.

B.2 Sampling Methods

This section summarizes field activities that will be performed in support of this test pit investigation. This section also provides references to SOPs, including investigation-specific modifications, where applicable, and test pit sampling-specific details not discussed in the SOPs. For comprehensive information, field personnel will refer to the SOPs included in Appendix B of the QAPP. H&S protocol for this test pit investigation is provided in the Kennedy/Jenks Consultants HSP.

Sampling activities will be performed in accordance with the QAPP. The specific procedures that will be employed, to the extent they apply to the test pit investigation, are located in Appendix B of the QAPP.

The following sections summarize field activities that will be performed during the implementation of the test pit investigation described in this FSP.

Analytical methods for all samples collected in accordance with this FSP are discussed in Section B.4.

B.2.1 Field Preparation

B.2.1.1 Field Team Training

Prior to conducting field activities, field team members, including BNSF subcontractor Olympus Technical Services (OTS) must complete the following, at a minimum:

- Read the EC's Site-specific HSP
- Attend an orientation session with EC's onsite H&S officer
- Read and understand all relevant governing documents
- Attain OSHA 40-hour HAZWOPER certification and relevant 8-hour refresher course certifications
- Attain respiratory protection course certification as required by 29 CFR 1910.134
- Attain asbestos awareness course certification as required by 29 CFR 1910.1001
- Attain BNSF Contractor Safety, ERailSafe and Roadway Worker Protection certifications
- Complete training on soil sample collection techniques to the satisfaction of the Field Team Leader (FTL).

The above-listed training requirements also apply to subcontractor, OTS, except for the requirements to read the EC's HSP, and completion of sample collection techniques. OTS will develop a site- and job-specific HSP, under which their onsite personnel will operate. The EC

will be responsible for the collection of soil sample; thus, OTS personnel will not be required to complete this training.

Documentation of trainings/certifications will be stored in the Libby project files located at the EC's Whitefish, Montana, project office. The project manager and field team leader will be jointly responsible for gathering and reviewing training documentation from OTS.

B.2.1.2 Field Planning Meeting (Internal Review)

Prior to beginning field activities, an internal field planning meeting (FPM) will be conducted by the EC's FTL, which will be attended by the field team members conducting the work including OTS, a member of the EC's QA staff, a member of the EC's H&S staff, and the BNSF PM. The agenda, prepared by the FTL, will be reviewed and approved by QA and H&S staff prior to the FPM. The FPM will briefly address and clarify:

- Documents governing fieldwork that must be in the field
- Changes in the governing documents
- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedule of events, and individual assignments
- Required QC measures
- H&S requirements
- BNSF-specific H&S requirements and procedures.

During the FPM, copies of the agenda will be distributed and an attendance list will be circulated for signature. The agenda and the completed attendance list will be maintained in the EC's project files. Additional meetings will be held if major changes to the documents governing fieldwork occur, or the scope of the assignment changes significantly.

Field team members, including OTS, will perform the following activities before and during field activities, as applicable:

- Review and understand applicable governing documents
- Record appropriate levels of documentation regarding activities conducted
- Ensure coordination between key staff, such as the A&E's sample coordinator and the project's removal contractor
- Obtain required sample containers and other supplies
- Obtain, check, and calibrate field sampling equipment

- Obtain and maintain PPE
- Coordinate with BNSF Roadmaster to obtain track protection.

B.2.1.3 Field Planning Meeting (External Review)

Following completion of the FPM, an external field planning meeting will be conducted and may include project personnel from EPA, DEQ, USACE, CDM Smith, CB&I Federal Services (CB&I), BNSF, LCPA, and the EC, as determined by the EPA PM. The EC will develop and circulate an agenda prior to the meeting, which may include the following discussion points (at a minimum):

- Project staff introductions
- Sampling logistics, work progression, and schedule
- On-track safety procedures during oversight
- Communication methods
- Sample custody and transportation logistics
- Laboratory coordination
- Libby-specific training schedule and location.

During the external field planning meeting, copies of the agenda will be distributed and an attendance list will be circulated for signature. The agenda and the completed attendance list will be maintained in the EC's project files. Additional meetings will be held if major changes to the documents governing fieldwork occur, or the scope of the assignment changes significantly.

B.2.1.4 Inventory and Procurement of Equipment and Supplies

An inventory of project-procured equipment and supplies will be conducted by the FTL prior to field work. Any additional required equipment or supplies will be procured. Acceptance of equipment, as pertinent, will be verified according to SOP EPA-LIBBY-2012-03, Control and Measurement and Test Equipment (see Appendix B of the QAPP). The following equipment is required for sampling activities conducted under this FSP:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card
- Sample paperwork and sample labels
- Custody seals
- Plastic zip-top bags

- Surface soil sampling equipment
- Global positioning system (GPS) unit(s) (e.g., iPad/ArcGIS setup, Trimble® GeoXT, or equivalent)
- PPE as required by the Site-specific HSP
- Measuring wheel/tape
- Land survey and/or aerial photograph
- Mini-excavator
- Equipment decontamination equipment and supplies
- Dust suppression equipment.

B.2.2 Sample Collection

This section describes the sampling methods and procedures that will be used to complete this test pit investigation.

B.2.2.1 Soil Sample Collection Methods

Methods and procedures used in this investigation are adopted from the *Operable Unit 5 Railroad Spur Investigation Quality Assurance Project Plan* (USACE 2014) and all soil samples will be collected in general accordance with Operable Unit 6 Right-of-Way Confirmation Surface Soil Sampling 30-Point Composite Sampling of Surface Soil for Asbestos – Revision 0 (see Appendix B of the QAPP), with the following exceptions:

- OTS will use a mini-excavator to excavate six test pits within the approximately 120-foot by 22-foot investigation area as shown on Figure 2. Test pits will be equally distributed across the investigation area (i.e., two test pits on each side of railroad track and one in the middle of track, if capable of doing so). Excavated soil from each of the six test pits will be segregated into two separate stockpiles, each comprised of different depths (i.e., one sample stockpile from 0 to18 inches, one sample stockpile from 18-36 inches). The sample areas will be marked by Kennedy/Jenks Consultants prior to excavation using a visual indicator (i.e., pin flags, marker paint, marking stakes).

- Two 30-point composite soil samples will be collected and submitted for laboratory analysis. One 30-point composite sample will consist of five individual aliquots from each of the six 0 to18 inches bgs soil stockpiles. The second 30-point composite sample will consist of five aliquots from each of the six 18 to 36 inches bgs soil stockpiles. Each aliquot will be collected from different random areas within the sample stockpile to ensure the sample is representative of the entire soil matrix of the stockpile.

- The final 30-point composite soil samples will be placed into 1-gallon plastic, resealable bag and weigh between 500 grams and 1,000 grams. Any debris, vegetation, or material

greater than ¾ inch in diameter will be removed prior to sealing the sample bag. The samples will be labeled with a sample identification sticker, provided by CDM Smith.

The collection of one field duplicate soil sample is anticipated. Kennedy/Jenks Consultants personnel will complete the appropriate portions of the field sampling data sheet (FSDS) for each soil sample. The labeled samples and completed FSDSs will be submitted to the CDM Smith sample coordinator in Libby, Montana, for chain-of-custody development and submission to the preparation and analyzing laboratories.

Upon completion of soil sampling activities, the contractor will return the stockpiled soils to the test pits and compact the soils using the mini-excavator. Stockpiled ballast, if present, will be placed over the surface of each test pit location, and the test pit location will be smoothed to remove potential trip hazards.

OTS will provide an onsite water supply and necessary equipment to suppress dust, if necessary, and equipment decontamination. No investigation derived waste will be generated since soil will be returned to the test pits, decontamination water will be allowed to infiltrate within the Investigation Area, and disposable sampling equipment will be disposed as municipal solid waste.

B.2.2.2 Visual Vermiculite Inspection and Sampling

Soil sampling will be conducted by Kennedy/Jenks Consultants personnel who have received training from EPA contractors to observe, and visually estimate visible vermiculite (VV). Prior to initiation of the test pit investigation, field staff will visually inspect the Investigation Area surface for VV. If an area of VV is observed, the field team will determine the approximate extent of VV, photograph the general area, and record location coordinates using the hand-held GPS unit. Information regarding the extent and location of the VV area will be recorded in the field notebook. Soil removed from the test pits will be observed for VV and occurrences will be described in the field book. VV encountered during the test pit investigation will be incorporated into appropriate soil stockpile and sampled. When sampling stockpiles contain VV, samplers will not bias aliquot locations based on the presence or absence of VV. The number of aliquots with VV will be recorded on the FSDS

B.2.3 Field Quality Control Samples

Field QC samples associated with test pit investigation are field duplicates. These samples are discussed below.

One field duplicate sample will be collected in the Investigation Area. Soil field duplicate aliquots will be collected immediately adjacent to the parent aliquot sample locations. Therefore, the field duplicate will reflect the representativeness of the sampling approach. There is currently no acceptance criteria established for soil field duplicates. Field duplicate sample results may be used preferentially to the field sample results (for the same area) for decision making. Additionally, laboratory QC sample results may also be used preferentially to the field sample results for decision making.

B.2.4 General Processes

This section describes the general field processes that will be used to support the sampling described in this FSP and includes references to the Site-specific SOPs and project-specific procedures when applicable.

B.2.4.1 Equipment Decontamination

Decontamination of reusable field equipment will be conducted in accordance with SOP EPA-LIBBY-2012-04, Field Equipment Decontamination (see Appendix B of the QAPP) with the following exceptions:

- Brushing is only required if visible soil remains after rinsing equipment.
- Air drying decontaminated equipment is not required prior to use.
- Prior to leaving the Site, heavy equipment (i.e., mini-excavator) will be decontaminated to remove visible soil from areas in contact with potentially impacted soil, such as tracks, bucket, etc.

Materials used in the decontamination process will be disposed of as investigation-derived waste (IDW) as described below. Re-usable sampling equipment will be rinsed before and after sample collection (not between each aliquot) and is not required to be wrapped in plastic or foil between uses.

B.2.4.2 Investigation-Derived Waste

See Section B.2.4.2 of the QAPP.

B.3 Samples and Locations

B.3.1 Field Documentation

See Section B.3.1 of the QAPP.

B.3.1.1 Field Sample Data Sheets

See Section B.3.1.1 of the QAPP.

B.3.1.2 Sample Identification

Samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. The labels will be affixed to the inside of both the inner and outer sample bags and the sample ID number will be written in indelible ink on the outside of each bag.

Sample ID numbers will identify the samples collected during this sampling effort using the following format:

BG-00400

Where:

BG = EPA assigned prefix designating samples collected under this FSP.

00400 = A sequential five-digit number assigned to each stockpile composite sample and field duplicate. Numbering will start at 00400 to differentiate from samples collected during the 2016 Confirmation Soil Sampling event (last sample submitted was BG-00331)

B.3.1.3 Field Logbooks

See Section B.3.1.3 of the QAPP.

B.3.1.4 Photographic Documentation

See Section B.3.1.4 of the QAPP.

B.3.1.5 Change Control

See Section B.3.1.5 of the QAPP.

B.3.1.6 GPS Coordinate Collection

See Section B.3.1.6 of the QAPP.

B.3.1.7 Field Sample Custody

See Section B.3.1.7 of the QAPP.

B.3.1.8 Chain-of-Custody Requirements

See Section B.3.1.8 of the QAPP.

B.3.1.9 Sample Packaging and Shipping

See Section B.3.1.9 of the QAPP.

B.3.1.10 Field Equipment Maintenance

See Section B.3.1.10 of the QAPP.

B.3.2 Holding Times

See Section B.3.2 of the QAPP.

B.3.3 Archival and Final Disposition

See Section B.3.3 of the QAPP.

B.4 Analytical Methods and Operations

See Section B.4 of the QAPP.

B.4.1 Analytical Methods and Turnaround Times

B.4.1.1 PLM-VE/PLM-Grav – Soil Samples

See Section B.4.1.1 of the QAPP.

B.4.1.2 Health and Safety Air Samples

Based on the negative results [asbestos concentrations generally below the OSHA permissible exposure limit (PEL)] of personal air sampling conducted in 2016, personal air samples will not be collected. Work will be performed in Level D PPE modified to include respiratory protection.

B.4.2 Analytical Data Reports

See Section B.4.2 of the QAPP.

B.4.3 Laboratory Data Reporting Tools

See Section B.4.3 of the QAPP.

B.4.4 Custody Procedures

See Section B.4.4 of the QAPP.

B.5 Quality Assurance/Quality Control

B.5.1 Field

See Section B.5.1 of the QAPP.

B.5.1.1 Training

See Section B.5.1.1 of the QAPP.

B.5.1.2 Modification Documentation

See Section B.5.1.2 of the QAPP.

B.5.1.3 Field Surveillances

See Section B.5.1.3 of the QAPP.

B.5.1.4 Field Audits

See Section B.5.1.4 of the QAPP.

B.5.1.5 Field QC Samples

See Section B.5.1.5 of the QAPP.

B.5.2 Troy Soil Preparation Facility (SPF)

See Section B.5.2 of the QAPP.

B.5.2.1 Training/Certifications

See Section B.5.2.1 of the QAPP.

B.5.2.2 Modification Documentation

See Section B.5.2.2 of the QAPP.

B.5.2.3 Soil Preparation Facility Audits

See Section B.5.2.3 of the QAPP.

B.5.2.4 Preparation QC Samples

See Section B.5.2.4 of the QAPP.

B.5.2.5 Performance Evaluation Standards

See Section B.5.2.5 of the QAPP.

B.5.3 Analytical Laboratory

See Section B.5.3 of the QAPP.

B.5.3.1 Training/Certifications

See Section B.5.3.1 of the QAPP.

B.5.3.2 Modification Documentation

See Section B.5.3.2 of the QAPP.

B.5.3.3 Laboratory Audits

See Section B.5.3.3 of the QAPP.

B.5.3.4 Laboratory QC Analyses

See Section B.5.3.4 of the QAPP.

B.5.3.4.1 Laboratory QC for PLM-VE and PLM-Grav

See Section B.5.3.4.1 of the QAPP.

B.6 Instrument Maintenance and Calibration

B.6.1 Field Equipment

See Section B.6.1 of the QAPP.

B.6.2 Laboratory Instruments

See Section B.6.2 of the QAPP.

B.7 Inspection/Acceptance of Supplies and Consumables

B.7.1 Field

See Section B.7.1 of the QAPP.

B.7.2 Laboratory

See Section B.7.2 of the QAPP.

B.8 Non-Direct Measurements

See Section B.8 of the QAPP.

B.9 Data Management

See Section B.9 of the QAPP.

B.9.1 Field Data Management

See Section B.9.1 of the QAPP.

B.9.2 Troy SPF Data Management

See Section B.9.2 of the QAPP.

B.9.3 Analytical Laboratory Data Management

See Section B.9.3 of the QAPP.

B.9.4 Libby Project Database

See Section B.9.4 of the QAPP.

B.9.5 Data Reporting

See Section B.9.5 of the QAPP.

Section C: Reporting Process

C.1 Assessment and Response Actions

See Section C.1 of the QAPP.

C.1.1 Assessments

See Section C.1.1 of the QAPP.

C.1.2 Response Actions

See Section C.1.2 of the QAPP.

C.2 Reports to Management

Progress reports will be emailed to BNSF for review, prior to submission to the EPA RPM for further distribution. Due to the short duration of the test pit investigation, it is anticipated that the EPA RPM will be notified approximately 5 days prior to the start of the test pit investigation and when the test pit investigation is complete. Additionally, QA reports will be provided to EPA management for routine audits and whenever quality problems are encountered. Field staff will note any quality problems on FSDSs or in field logbooks. Further, the field and laboratory managers will inform the EPA RPM, BNSF, and the EC Project Manager upon encountering quality issues that cannot be immediately corrected.

Section D: Data Quality Assurance Process

D.1 Data Review, Verification, and Validation

D.1.1 Data Review

See Section D.1.1 of the QAPP.

D.2 Verification and Validation Methods

D.2.1 Data Verification

See Section D.2.1 of the QAPP.

D.2.2 Data Validation

See Section D.2.2 of the QAPP.

D.3 Reconciliation with User Requirements

See Section D.3 of the QAPP.

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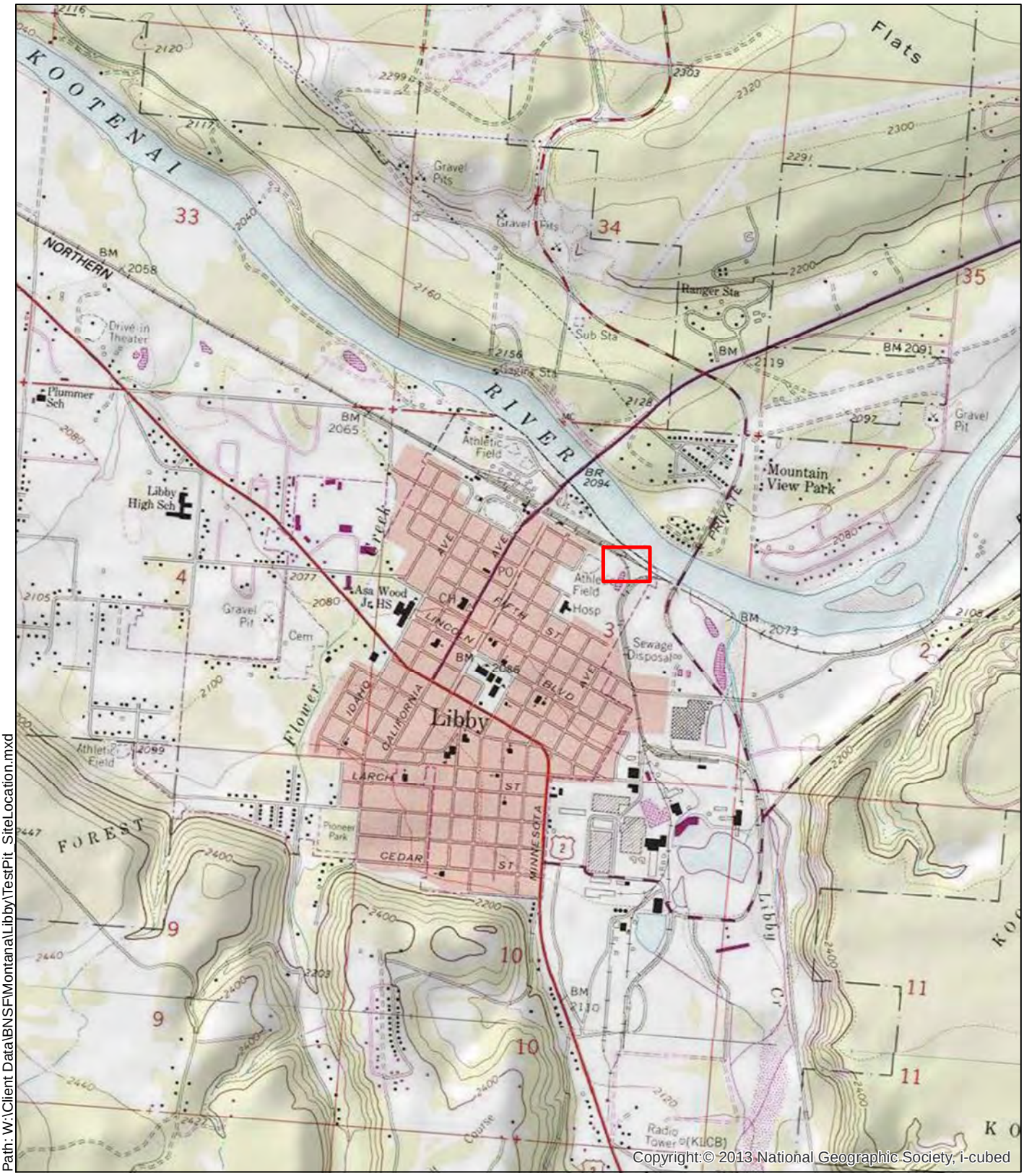
Figures



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Legend

Site Location

N

0 2,000 4,000 Feet

Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Lincoln County, Montana

Site Location

1749206.00
March 2017

Figure 1

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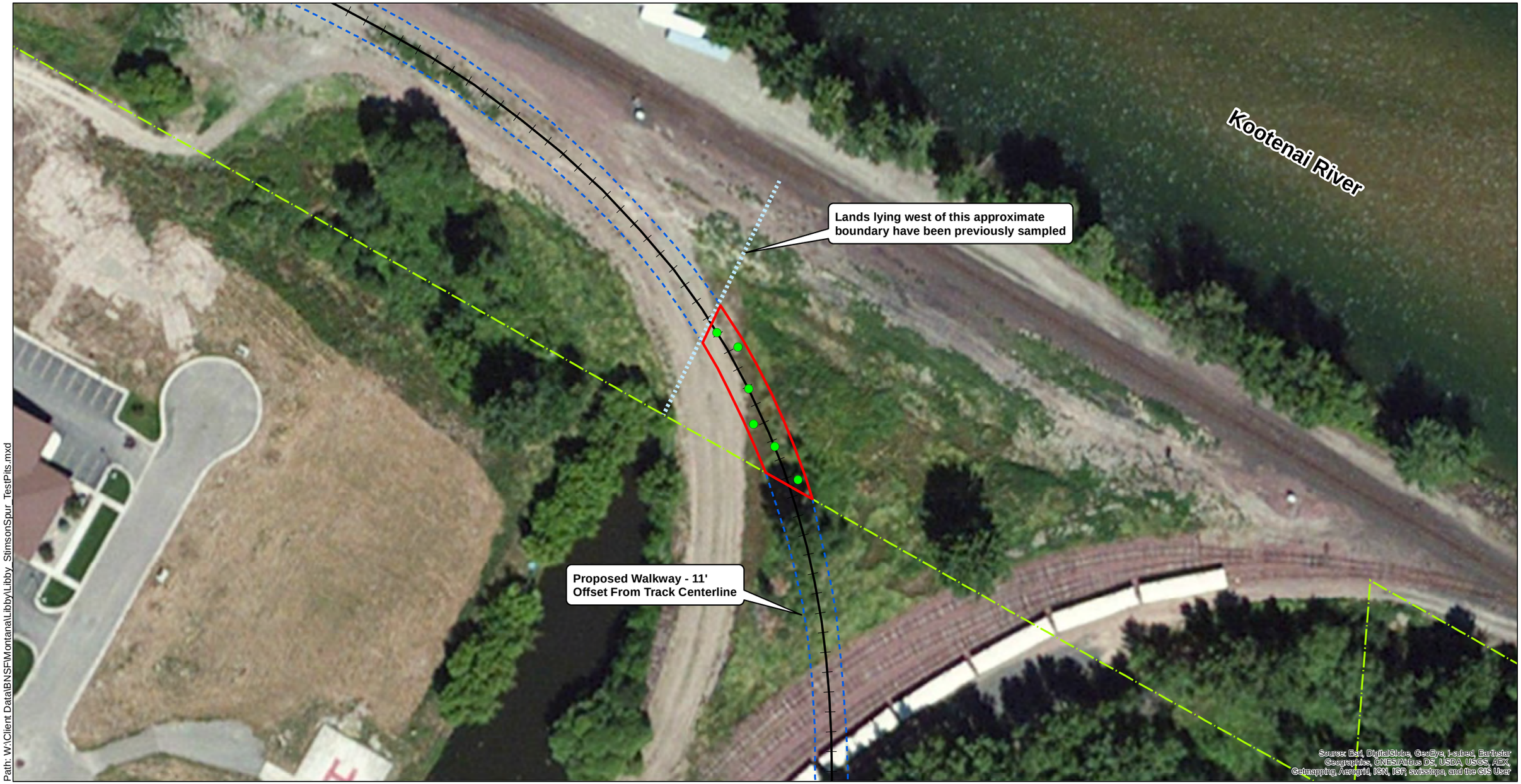

Legend

- Test Pit Locations
- Investigation Area
- Proposed Track Alignment
- Proposed Walkway Offset
- Approximate Boundary of Previous Sampling Efforts
- Approximate BNSF Property Boundary

NOTES:
(1) All locations are approximate.
(2) Proposed track alignment and associated improvements from KLJ Engineering.

N

0 30 60 120 Feet

Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Lincoln County, Montana

Stimson Spur Investigation Area and Test Pit Locations

1749206.00
March 2016

Figure 2

Appendix A

Final Quality Assurance Project Plan (Revison 1)

Kennedy/Jenks Consultants

405 E. Superior Street, Suite 250
Duluth, MN 55802
218-228-2670
218-481-7303 (Fax)

Final Quality Assurance Project Plan

Revision 1

Operable Unit 6 Confirmation Surface Soil Sampling
Libby Asbestos Site, Operable Unit 6
Libby, Montana

August 2016

Prepared for

BNSF Railway Company
800 North Last Chance Gulch, Suite 101
Helena, MT 59601

K/J Project No. 1649206.10

Section A: Project Management

A.1 Title and Approval Sheet

Title: Operable Unit 6 Confirmation Surface Soil Sampling Quality Assurance Project Plan, Libby Asbestos Site, Operable Unit 6, Revision 1, 08/11/2016.

Reviewed by: _____ Date: 11 August 2016
Scott Carney
Kennedy/Jenks Consultants Project Manager

Reviewed by: _____ Date: 11 August 2016
Yueh Chuang, P.E.
BNSF Railway Company Manager Environmental Remediation

Approved by: _____ Date: 8/11/16
Dania Zinner
EPA Region VIII Operable Unit 6 Remedial Project Manager

Approved by: _____ Date: 8/11/16
Rebecca Thomas
EPA Region VIII Libby Asbestos Project Team Leader

Approved by: _____ Date: 8/11/16
David Berry
EPA Region VIII Quality Assurance Reviewer

A.2 Table of Contents

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Acronyms and Abbreviations

%	percent
A&E	architect and engineering contractor
ABS	activity-based sampling
APP	Accident Prevention Plan
AS	analytical sensitivity
ASTM	American Society from Testing and Materials International
BNSF	BNSF Railway Company
CAR	corrective action request
CB&I	CB&I Federal Services
CDM Smith	CDM Federal Programs Corporation
COC	chain-of-custody
CFR	Code of Federal Regulations
COR	Contracting Officer Representative
DEQ	Montana Department of Environmental Quality
DQOs	data quality objectives
EC	BNSF's Environmental Consultant (Kennedy/Jenks Consultants)
EDD	electronic data deliverable
EDS	energy dispersive spectroscopy
EPA	U.S. Environmental Protection Agency
ERT	EPA Environmental Response Team
ESAT	EPA Environmental Services Assistance Team
f/cc	fibers per cubic centimeter
FPM	field planning meeting
FSDS	field sample data sheet
FTL	Field Team Leader
GIS	geographic information system
GPS	global positioning system
H&S	health and safety
HSP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICs	Institutional Controls
ID	identifier
IDW	investigation-derived waste
LA	Libby Amphibole asbestos
LADT	Libby Asbestos Data Tool
LC	Laboratory Coordinator
MP	milepost
N	number

Acronyms and Abbreviations

NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
OU	operable unit
PE	performance evaluation
PLM	polarized light microscopy
PLM-Grav	polarized light microscopy – gravimetric
PLM-VE	polarized light microscopy – visual area estimation
PPE	personal protective equipment
QA	quality assurance
QAM	Quality Assurance Manager
QAPP	quality assurance project plan
QATS	Quality Assurance Technical Support
QC	quality control
RAL	remedial action levels
ROD	record of decision
ROM	Record of Modification
ROW	right-of-way
RPM	Remedial Project Manager
Site	Libby Asbestos Superfund Site
SOP	standard operating procedure
SPF	sample preparation facility
TEM	transmission electron microscopy
USACE	U.S. Army Corps of Engineers
USDOT	United States Department of Transportation
USGS	U.S. Geological Survey
VV	visible vermiculite
Weston	Weston Solutions, Inc.

A.3 Distribution List

Copies of this completed and signed quality assurance project plan (QAPP) will be distributed to:

U.S. Environmental Protection Agency, Region VIII
1595 Wynkoop Street
Denver, Colorado 80202-1129

- *Rebecca Thomas, Thomas.Rebecca@epa.gov (electronic copy)*
- *Dania Zinner, Dania.Zinner@epa.gov (electronic copy)*

BNSF Railway Company
800 North Last Chance Gulch, Suite 101
Helena, MT 59601

- *Yueh Chuang, Yueh.Chuang@BNSF.com (electronic copy)*

Montana Department of Environmental Quality
1100 North Last Chance Gulch
Helena, Montana 59601

- Lisa Dewitt, LiDewitt@mt.gov (electronic copy)

TechLaw, Inc.
ESAT, Region VIII
16194 West 45th Drive
Golden, Colorado 80403

- Doug Kent, Kent.Doug@epa.gov (electronic copy)

CDM Smith, Libby Project Office
60 Port Boulevard, Suite 201
Libby, Montana 59923

- Thomas Cook, cookTE@cdmsmith.com (electronic copy)
- Scott Felton, feltonDS@cdmsmith.com (electronic copy)

Kennedy/Jenks Consultants, Field Office
116 Lupfer Avenue, Suite B
Whitefish, MT 59937

- Scott Carney, ScottCarney@KennedyJenks.com (electronic copy)
- Lauren Knickrehm, LaurenKnickrehm@KennedyJenks.com (electronic copy)

On behalf of the BNSF Railway Company (BNSF), copies of the QAPP will be distributed to the individuals above by the BNSF's environmental consultant (EC) (Kennedy/Jenks Consultants) in electronic format (as indicated above). The EC's Project Manager (or their designee) will distribute updated copies each time a QAPP revision occurs. An electronic copy of the final, signed QAPP (and subsequent revisions) will also be posted to the Libby OU6 eRoom.

A.4 Project Task Organization

Figure A-1 presents an organizational chart that shows lines of authority and reporting responsibilities for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, technical support, and quality assurance (QA) for this project.

A.4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within the Libby Asbestos Superfund Site (Site). The EPA Region 8 Libby Asbestos Project Team Leader is Rebecca Thomas. The EPA Remedial Project Manager (RPM) for Operable Unit (OU) 6 is Dania Zinner.

The U.S. Army Corps of Engineers (USACE), Omaha District, provides project oversight, on behalf of the EPA. The USACE has an interagency agreement number with the EPA, number DW96954027, through which the USACE oversight work will be performed. USACE's Project Manager and Contracting Officer Representatives (CORs) are Mary Darling and Mark Meacham, respectively.

The Montana Department of Environmental Quality (DEQ) is the support regulatory agency for Superfund activities at the Site. The DEQ Project Manager for these activities is Lisa Dewitt. The EPA will consult with DEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act, the National Contingency Plan, and applicable guidance in conducting Superfund activities.

The BNSF owns and operates the property contained within OU6 and manages environmental remediation-related issues through their Environmental Remediation department. BNSF oversight and management of OU6 is assigned to Yueh Chuang, P.E., Manager Environmental Remediation.

BNSF has contracted with Kennedy/Jenks Consultants to represent BNSF as the project EC and provide BNSF with QAPP development and maintenance, data collection (sampling), and project management services.

A.4.2 Technical Support

A.4.2.1 QAPP Development

This QAPP was developed by the EC at the direction of BNSF, and with oversight by EPA. This QAPP contains the required QAPP elements and has been developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001), *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5* (EPA 2002), and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006).

Copies of the QAPP will be distributed by the EC's Project Manager (or their designee), in electronic format, as indicated in Section A3 - Distribution List. The EC's Project Manager (or their designee) will distribute updated copies each time a QAPP revision occurs. An electronic

copy of the final, signed QAPP (and subsequent revisions) will also be posted to the Libby Field eRoom by the EPA (or their designee).

A.4.2.2 Field Sampling Activities

The EC will be responsible for conducting all field confirmation sampling activities described in this QAPP. Key EC personnel who will be involved in this confirmation sampling program include:

- Scott Carney, Project Manager
- Lauren Knickrehm, Field Team Leader
- Gregg Bryden, Laura Kennedy, Quality Assurance Team
- Field Sampling Team Members include Laura Klein, Annika Silverman, Rick Welchoff, Daniel Kroll, Diane Rauch, and Julia Schwartz.
- James Bowland, Health and Safety (H&S) Manager.

A.4.2.3 Asbestos Analysis

Samples collected as part of this project will be sent for preparation and analysis for asbestos at analytical laboratories selected and approved by the EPA to support the Site. The EPA Environmental Services Assistance Team (ESAT) is responsible for procuring all sample preparation facility (SPF) and analytical laboratory services and providing direction to the entities providing these services. Don Goodrich (EPA Region 8) is responsible for managing the ESAT laboratory support contract for asbestos. The ESAT Region 8 Team Manager at TechLaw, Inc. is Mark McDaniel. He is also the designated laboratory coordinator (LC) for the Libby project and is responsible for directing the analytical laboratories, prioritizing analysis needs, and managing laboratory capacity.

A.4.2.4 Data Management

The project data management processes and reporting requirements, and related contractor responsibilities, are described in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2015). This document is managed by the EPA Data Manager and can be found in both the Libby Field (https://team.cdm.com/eRoom/R8-RAC/Libby/0_aea4) and Lab eRooms (https://team.cdm.com/eRoom/mt/LibbyLab/0_bf6e). Terry Crowell is the CDM Smith eRoom coordinator responsible for managing user accounts; eRoom accounts may be requested via email at CrowellTL@cdmsmith.com.

Sample and location data generated as part of this QAPP will be managed and maintained in Scribe. The EPA Environmental Response Team (ERT) is responsible for the administration of all Scribe data management aspects of this project. Joseph Schafer is responsible for overseeing the ERT data management support contract. ERT is responsible for the development and management of Scribe and the project-specific data reporting requirements for the Libby project.

CDM Smith's Field Data Manager, Diane Rode, is responsible for overseeing the upload of sample and location information to the field Scribe project database.

ESAT is responsible for uploading new analytical results to the analytical Scribe project database. The ESAT Project Data Manager for the Libby project is Janelle Lohman (TechLaw, Inc.).

In addition to sample and location data, OU6 property information will be managed in EPA's Response Manager database. Weston Solutions, Inc. (Weston) is responsible for administering the Response Manager database, and Brad Morgan is Weston's Response Manager Administrator.

Because of the quantity and complexity of the data collected at the Site, the EPA has designated a Libby Data Manager to manage and oversee the various data support contractors. The EPA Region 8 Data Manager for the Libby project is Jeff Mosal.

A.4.3 Quality Assurance

There is no individual designated as the EPA Quality Assurance Manager (QAM) for the Libby project. Rather, the Region 8 QA program has delegated authority to the EPA RPMs. This means the EPA RPMs have the ability to review and approve governing documents developed by Site contractors. Thus, it is the responsibility of the EPA RPM or their designee for this sampling effort, David Berry, to ensure that this QAPP has been prepared in accordance with the EPA QA guidelines and requirements. David Berry is independent of the entities planning and obtaining the data described in this QAPP.

For this project, the EPA is supported by the Quality Assurance Technical Support (QATS) contractor, CB&I Federal Services (CB&I). The QATS contractor will evaluate and monitor laboratory QA and quality control (QC) activities and is responsible for performing annual audits of each analytical laboratory. CB&I's QAM for this project is Michael Lenkauskas.

As the project lead on behalf of the EPA, USACE is responsible for overall QA of this confirmation sampling program. This includes involvement of USACE QA management and staff, which comprises senior-level members who perform duties as QA representatives for the project. These QA representatives are independent of the USACE project team that manage and execute the work (including data collection and use). They are responsible for assuring work is performed in conformance with the QA program and project-specific requirements. The USACE QAM monitors quality through the assigned onsite personnel listed below. If significant issues are encountered, the QAM has stop work authority via the USACE COR, Mary Darling or Mark Meacham. It is anticipated that David Ray will serve as the USACE QAM for this confirmation sampling effort; however, other staff may ultimately be identified to fill this role. The USACE will notify the EPA of changes in project QA staff.

USACE rotates several personnel to Libby to maintain an onsite presence. Collectively, the onsite personnel are responsible for oversight, coordination of project work/scope objectives, and contract administration. USACE onsite personnel report to the USACE Project Manager. The following onsite USACE personnel will maintain QA oversight of this confirmation sampling program:

- Jeremy Ayala, Project Engineer
- Mark Buss, Onsite QAM
- Brian Broekemeier, Construction Control Representative

CB&I Federal Services QAM for this project, Mr. Michael Lenkauskas, reports to Mr. David Berry on QA matters. Under Mr. Berry's oversight, Mr. Lenkauskas is responsible for monitoring and evaluating laboratory QA/QC.

A.5 Problem Definition/Background

A.5.1 Site Background

Libby is a community in northwestern Montana located 7 miles southwest of a vermiculite mine that operated from the 1920s until 1990. The mine began limited operations in the 1920s and was operated on a larger scale by W.R. Grace and Company from approximately 1963 to 1990. Studies revealed that the vermiculite from the mine contains amphibole-type asbestos, referred to as Libby Amphibole asbestos (LA).

Epidemiological studies revealed that workers at the mine had an increased risk of developing asbestos-related lung disease (McDonald et al. 1986; Amandus et al. 1987; Amandus and Wheeler 1987; Sullivan 2007; Larson et al. 2010, 2012a, 2012b). Additionally, radiographic abnormalities were observed in 17.8 percent (%) of the general population of Libby including former workers, family members of workers, and individuals with no specific pathway of exposure (Peipins et al. 2003). Although the mine has ceased operations, historical or continuing releases of LA from mine-related materials could be serving as a source of ongoing exposure and risk to current and future residents and workers in the area. The Site was listed on the National Priorities List in October 2002.

Sampling efforts began in 2001 and focused primarily on characterization of impacts in and around the BNSF Libby Railyard. Sampling efforts after response actions, which were completed at the BNSF Libby Railyard in 2004 and 2005, have primarily focused on receptor exposure during railroad maintenance activities along the tracks outside the BNSF Libby Railyard. The largest of these efforts was an activity-based sampling (ABS) event, which occurred in late 2008 in cooperation with EPA and oversight provided by CDM Smith. In addition, BNSF has conducted additional sampling events, beyond EPA requirements, to monitor compliance with Occupational Safety and Health Administration (OSHA) regulations.

Summaries of past OU6 investigations and response actions can be found in *Final Remedial Investigation Report for Operable Unit 6 at the Libby Asbestos Site – Libby, Montana* (Kennedy/Jenks Consultants 2014) and *Final Data Summary Report Operable Unit 6 – BNSF Railyard, Track and Right-of-Way, Libby Asbestos Site, Libby, Montana* [United States Department of Transportation (USDOT) 2008]. The OU6 investigation and response action history are summarized in Table A-1.

Table A-1: Summary of Past OU6 Investigations and Response Actions

Date	Investigation Name	Location	Purpose
Pre-2005 Investigation and Response Action History			
Apr-01	Soil/Undercutter Spoils Sampling	MP 1312-1320	Characterization
Nov-01	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Oct-02	Railyard Soil Characterization Sampling	MP 1319.3-1320	Characterization
Nov-02	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Aug-03	2003 Response Action	MP 1319.3-1320	Delineation
Jul-04	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Sep-04	Railyard Soil Sampling	MP 1319.3-1320	Delineation
Sep-Nov-04	2004 Libby Railyard Response Action	MP 1319.3-1320	OSHA, Clearance
Nov-05	2005 Libby Railyard Response Action	MP 1319.3-1320	OSHA, Clearance
Post-2005 Investigation History			
Jul-08	Rail Crossing Air Monitoring Report	MP 1321.8, MP 1324.3	OSHA
Sep-08	BNSF OSHA Exposure Sampling Summary Report - Steel Gang	MP 1312-1341	OSHA
Sep-08	Activity Based Sampling Summary Report - Public Receptors	MP 1312-1341	ABS Delineation
Sep-08	Activity Based Sampling Summary Report - Worker Receptors	MP 1312-1341	ABS
May-09	BNSF Personnel OSHA Exposure Sampling Report - Supersurfacing Gang	OU6	OSHA
Jun-09	BNSF Undercutter Spoils Sampling Report	MP 1329.8-1333.02	Characterization
Mar-10	BNSF Asbestos Exposure Sampling Report - Steel Gang	MP 1308.5-1344	OSHA
May-10	BNSF Asbestos Exposure Sampling Report - Stimson Wye Removal	MP 1319.41 to 3rd Street terminus	OSHA
Sep-11	BNSF Personnel OSHA Exposure Sampling Report	1313-1342.1	OSHA

Notes:
MP – milepost
OSHA – Occupational Safety and Health Administration
ABS – activity based sampling

A.5.2 Reasons for this Project

Portions of OU6 between milepost (MP) 1312 and 1320 have been classified as "investigation complete" by the EPA (as shown on Figure B-3) as completed corrective actions and surface and subsurface soil data collected to date has been determined as sufficient to reduce uncertainties about LA concentrations in soil. However, localized surface soil sampling efforts have partially characterized portions of OU6 outside MP 1312 to MP 1320 and results indicate LA concentrations ranging from Bin A (non-detect) to Bin B2 (<1%) by polarized light microscopy using visual area estimation (PLM-VE). Reported concentrations are less than the Transportation Corridor remedial action level (RAL) (see Section A5.3). These partially

characterized portions of OU6 are referenced in the *Protectiveness Evaluation for Potential Risk Management Approaches Libby Asbestos Superfund Site – Operable Units 4, 5, 6, 7, and 8* (CDM Smith 2015, Section 8.2.3, page 31) as having, "some uncertainties regarding whether RALs could be exceeded in locations where soil samples have not been collected."

EPA has requested confirmatory surface soil sampling be conducted within the BNSF right-of-way (ROW) between MP 1301 to MP 1312, MP 1320 to 1336.33 and MP 1336.58 to MP 1342 where surface soil sampling has not been completed at regular intervals. Sampling will not be completed within the Troy Tunnel (approximately MP 1336.33 to MP 1336.58) due to the lack of exposed soil within the tunnel. Specifically, the EPA and their consultant CDM Smith identified and categorized the extent of the mainline track and rail sidings where surface soil sampling has been requested, as reproduced on Figure B-3[1]. This sampling effort will herein be referred to as ROW Confirmation Surface Soil Sampling.

Additionally, EPA has requested confirmatory surface soil sampling at two properties located within the ROW that are not actively operated by BNSF. These properties consist of the following:

- Ground surface (BNSF-owned land) above the Troy Tunnel ROW which bisects land owned by the City of Troy. The City of Troy has reportedly included the BNSF ROW as part of a waste transfer station.

- BNSF-owned land south of the Libby Amtrak Depot used for parking, driveways, and green space.

Sampling conducted at these two specific locations will herein be referred to as Non-Operating Property Confirmation Surface Soil Sampling.

Physical cleanup of LA contaminated soils has been completed by BNSF, within OU6, and specifically within the BNSF Libby Railyard. Subsequent ABS investigations and soil confirmatory sampling have been conducted in OU6, which support the conclusion that these removal actions were effective in mitigating LA exposures, and no further physical cleanups are likely necessary in OU6 (CDM 2015, Section 8.2.3). Both ROW and Non-Operating Property Confirmatory surface soil sampling efforts (discussed in Section B) will serve to determine if surface soils with LA concentrations greater than the Transportation Corridor RAL (concentrations $\geq$ 1 percent LA) are present in OU6. If LA concentrations in surface soils are less than the Transportation Corridor RAL, then remedial actions are likely to be limited to institutional controls (ICs).

Therefore, the reason for this project is to determine whether LA concentrations in surface soils within OU6 exceed the Transportation Corridor RAL.

The two primary objectives of this confirmatory sampling effort are to:

1. Determine whether LA concentrations in soil on BNSF-owned property within OU6 exceed the Transportation Corridor RAL.

[1] The start and end railroad MPs shown on the CDM Smith figure was corrected by Kennedy/Jenks Consultants.

2. Compare surface soil data, collected as part of this confirmatory sampling effort, to the Transportation Corridor RAL, to determine if remedial actions consisting of institutional controls will be sufficiently protective of receptors in OU6 or whether physical cleanup actions will be required.

Portions of OU6 to be sampled during this confirmation sampling effort (MP 1301 to MP 1312 and MP 1320 to 1336.33 and MP 1336.58 to MP 1342), are herein referred to as the ROW Confirmation Sampling Area. BNSF-owned land abutting the Libby Amtrak Depot and BNSF-owned land above the Troy Tunnel are herein referred to as the Non-Operating Property Confirmation Sampling Area.

A.5.3 Applicable Criteria and Action Limits

At the Site, the EPA has developed RALs for contaminated soils that are applicable to removal actions performed within transportation corridors (OU6 and OU8). These RALs defines the condition when remedial action is and is not needed for LA contamination in soil (EPA 2016). The RAL for LA contamination in surface soils for transportation corridors, including OU6, is LA soil concentrations of Bin C by polarized light microscopy-visual area estimation (PLM-VE), or LA is present at concentrations greater than or equal to 1%. RALs are defined in *Record of Decision for Libby Asbestos Superfund Site – Libby and Troy Residential and Commercial Properties, Park and Schools, Transportation Corridors, and Industrial Park, Operable Units 4 through 8, Lincoln County, Montana* (ROD) (EPA 2016).

Personal air monitoring of sampling personnel will be performed in accordance with OSHA requirements, as specified in the Site-specific health and safety plan (HSP). In accordance with these requirements, samples will be analyzed for asbestos by phase contrast microscopy and compared to the OSHA limits for workplace exposures. The short-term (30-minute) exposure limit is 1.0 fiber per cubic centimeter of air (f/cc), and the long-term time-weighted average exposure limit is 0.1 f/cc.

A.6 Project/Task Description

A.6.1 Task Summary

Basic tasks required to implement this QAPP include the collection of 30-point composite surface soil samples within the ROW and Non-Operating Property Confirmation Sampling Areas. Surface soil sampling tasks will occur in the ROW and Non-Operating Property Confirmation Sampling Areas within OU6 where feasible (see Figures B-4, B-6 and B-7). Specific sampling tasks are described in greater detail in Sections B.2 and B.3.

Decisions regarding removal will be guided by the ROD (EPA 2016) and supported by the data gathered in accordance with this QAPP.

A.6.2 Work Schedule

The work schedule for performing tasks associated with this QAPP begins with collection of surface soil samples from locations identified for this confirmation sampling effort. It is anticipated that this task will occur during summer 2016. It is anticipated that approximately 50 field days will be required to complete the ROW Confirmation Sampling effort. An additional 8

days is anticipated to complete confirmation sampling on the Non-Operating Properties. The number of days required to complete visual vermiculite sampling will be dependent on the number of visible vermiculite areas to be sampled. Sample analysis and data evaluation and interpretation tasks will be performed immediately following sample collection.

A.6.3 Locations to be Evaluated

Location selection for the collection of surface soil samples is described in Section B.2.1.1. Soil sampling locations are shown in Figure B-4, B-6, and B-7.

A.6.4 Resources and Time Constraints

Tasks associated with this QAPP may be conducted year-round; however, outdoor field work is limited by weather conditions and available daylight.

A.7 Quality Objectives and Criteria

A.7.1 Data Quality Objectives

Data quality objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The design of a study is closely tied to the DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and types of analyses to be performed. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a confirmation sampling program will be adequate to support reliable Site-specific decision-making (EPA 2001, 2006).

Appendix A provides the detailed implementation of the seven-step DQO process associated with this QAPP.

A.7.2 Performance Criteria

The primary goal of this QAPP is to provide data to determine whether LA concentrations in ROW and Non-Operating Property Confirmation Sampling Areas exceed the Transportation Corridor RAL. Therefore, the performance criteria and analytical requirements are based on the requirements specified in the ROD (EPA 2016).

These requirements are specified as part of the DQOs (see Appendix A). The analytical requirements for LA measurements established in Section B.4 provide that results from this study will be directly comparable to results from historical and planned future sampling efforts.

A.7.3 Precision

For surface soil samples, field duplicates for surface soil sampling activities will be collected (see Section B.2.3). Analysis of these field duplicates will provide a measure of the precision of the sampling and analysis process. Additionally, preparation and laboratory duplicates will be created to provide a measure of the precision during sample preparation and analysis by the laboratory.

A.7.4 Bias and Representativeness

To the extent feasible, samples will be collected and analyzed in accordance with the procedures set forth in this QAPP, which are consistent with previous sampling efforts of soil. This will ensure that results of this study are representative and appropriate for comparison to other data sets.

Laboratory accuracy is determined through the analysis of performance evaluation standards, which are soil samples, spiked with a known quantity of LA, added to chain-of-custody documents and analyzed simultaneously with non-QA/QC soil samples

A.7.5 Completeness

Target completeness for this project is 100%. That is, 100% of samples collected are expected to be analyzed. If any samples are not analyzed, or if LA analysis is not completed successfully, this could result in incomplete property characterization. In this event, BNSF will discuss the steps necessary to support EPA decision-making.

A.7.6 Comparability

The data generated during this confirmation sampling effort will be obtained using standard or project-specific analytical methods for LA that have been utilized previously in other studies, and will yield data that are comparable to previous analyses of LA in soil samples.

A.7.7 Method Sensitivity

The method sensitivity [analytical sensitivity (AS)] needed for LA analysis of each medium is discussed in Section B.4.

A.8 Special Training/Certifications

A.8.1 Field

Asbestos is a hazardous substance that can increase the risk of cancer and serious non-cancer effects in people who are exposed by inhalation. Therefore, all individuals involved in the collection, packaging, and shipment of samples must have appropriate training. Prior to starting field work, field team members working on, or adjacent to, BNSF tracks must complete the following, at a minimum:

Table A-2: Training Requirements

Training Requirement	Documentation Specifying Training Requirement Completion
Read and understand the site-specific HSP	HSP signature sheet
Attend an orientation session with the field H&S Manager	Orientation session attendance sheet
Complete OSHA 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8-hour refreshers	OSHA training certificates
Hold current 40-hour HAZWOPER medical clearance	Physician letter in the field personnel files
Complete respiratory protection training, as required by 29 Code of Federal Regulations (CFR) 1910.134	Training certificate
Complete asbestos awareness training, as required by 29 CFR 1910.1001	Training certificate
BNSF Contractor Safety Training	Training card
BNSF Roadway Worker Protection	Training card
ERailSafe Certification	Training card

H&S-related training documentation will be stored in the EC's on-site HSP. It is the responsibility of the field H&S Manager to keep H&S-related training documentation up-to-date and on file for each field team member.

Prior to beginning field sampling activities, a field planning meeting will be conducted to discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- QA/QC requirements
- H&S requirements
- On-track safety procedures.

It is the responsibility of each field team member to review and understand applicable governing documents associated with this confirmation sampling program, including this QAPP, associated standard operating procedures (SOPs) (see Appendix B and the applicable HSP).

A.8.2 Analytical Laboratory

A.8.2.1 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Each laboratory is accredited by the National Institute of Standards and Technology (NIST)/National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of airborne asbestos by transmission electron microscope (TEM) and/or analysis of bulk asbestos by polarized light microscopy (PLM). This includes the analysis of NIST/NVLAP standard reference materials, or other verified quantitative standards, and successful participation in two proficiency rounds per year each of bulk asbestos by PLM and airborne asbestos by TEM supplied by NIST/NVLAP.

Copies of recent proficiency examinations from NVLAP or an equivalent program are maintained by each participating analytical laboratory. Many of the laboratories also maintain certifications from other state and local agencies. Copies of all proficiency examinations and certifications are also maintained by the LC.

Each laboratory working on the Libby project is also required to pass an onsite EPA laboratory audit. The details of this EPA audit are discussed in Section B.5.3.3. The LC also reserves the right to conduct additional investigations deemed necessary to determine the ability of each laboratory to perform the work. Each laboratory also maintains appropriate certifications from the state and possibly other certifying bodies for methods and parameters that may also be of interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

A.8.2.2 Laboratory Team Training/Mentoring Program

Initial Mentoring

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The training program includes a rigorous 2 to 3-day period of onsite training provided by senior personnel from those laboratories already under contract on the Libby project, with oversight by the QATS contractor. The tutorial process includes a review of morphological, optical, chemical, and electron diffraction characteristics of LA, as well as training on project-specific analytical methodology, documentation, and administrative procedures used on the Site. The mentor will also review the analysis of at least one sample by each type of analytical method with the trainee laboratory.

Site-specific Reference Materials

Because LA is not a common form of asbestos, United States Geological Survey (USGS) has also prepared site-specific reference materials of LA in soil for use during PLM-VE method analysis (EPA 2008). These reference materials were prepared by adding aliquots of LA spiking material to uncontaminated Libby soils to obtain nominal LA concentrations of approximately 0.2%, 0.5%, 1.0%, and 2.0% (by weight). Each laboratory was provided with samples of these

reference materials for use in training PLM analysts in the visual area estimation of LA levels in soil. In addition, aliquots of these reference materials (as well as other spiked soils) are also utilized as PE standards to evaluate PLM laboratory accuracy.

Regular Technical Discussions

Ongoing training and communication is an essential component of QA for the Libby project. To ensure that all laboratories are aware of technical or procedural issues that may arise, a regular teleconference is held between the EPA, their contractors, and each of the participating laboratories. Other experts (e.g., USGS) are invited to participate when needed. These calls cover aspects of the analytical process, including sample flow, information processing, technical issues, analytical method procedures and development, documentation issues, project-specific laboratory modifications, and pertinent asbestos publications.

Professional/Technical Meetings

Another important aspect of laboratory team training has been the participation in technical conferences. The Libby laboratory team has convened on multiple occasions at the American Society for Testing and Materials (ASTM) Johnson Conferences in Vermont and at the ASTM Michael E. Beard Asbestos Conferences. These conferences enable the Libby laboratory and technical team members to have an ongoing exchange of information regarding all analytical and technical aspects of the project, including the benefits of learning about developments by others.

A.8.2.3 Analyst Training

All PLM analysts for the Libby project are expected to be familiar with routine chemical laboratory procedures, principles of optical mineralogy, and proficient in EPA Method 600/ R-93/116, NIOSH Method 9002, CARB Method 435, and Site-specific SOPs SRC-LIBBY-01 and SRC-LIBBY-03. Analysts with less than 1 year of experience specific to the Libby project are required to participate in the laboratory mentoring program to obtain additional guidance and instruction. This training is provided by the laboratory managers and/or senior PLM analysts that are familiar with the types of asbestos and analytical challenges encountered at the Site. Before performing any Site analyses, the analyst must demonstrate the ability to generate acceptable accuracy and precision for the LA-specific reference materials.

Satisfactory completion of each of these training tasks must be approved by a senior PLM analyst. A training checklist or logbook is used to ensure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all analysts have completed the required training requirements.

A.9 Documentation and Records

A.9.1 Field

Field documentation will be collected and stored in order to meet project data reporting requirements, as specified in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2015). Field teams will record information on hard copy forms, which will be submitted to the CDM Smith for entry using prescribed electronic technology/systems (e.g., Field Data Manager). The EC will retain a hard copy field documentation, which will be maintained and

archived at the EC's project office in Whitefish, Montana. Field documentation is discussed in detail in Section B.3.1. Field data management, including publishing data to Scribe, is discussed in detail in Section B.9.1.

A.9.2 Troy Sample Preparation Facility

Prior to asbestos analysis, confirmation surface soil samples are prepared (dried, sieved, ground) at the SPF in Troy, Montana. Troy SPF documentation will be prepared and stored in accordance with project data reporting requirements, as specified in the EPA Data Management Plan for the Libby Asbestos Superfund Site (EPA 2015). Troy SPF personnel will record information using available electronic technology/systems, or hard copy forms, as appropriate, and publish required data to Scribe. All log sheets are maintained and archived at the Troy SPF. Scanned copies of log sheets are maintained on the ESAT network drive. These scanned copies are also emailed to the appropriate project Data Manager. Troy SPF data management is discussed in detail in Section B.9.2.

A.9.3 Laboratory

Analytical laboratory documentation will be prepared and stored in order to meet project data reporting requirements, as specified in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2015). All asbestos analytical (including preparation) data generated in the laboratory will be documented on Site-specific laboratory bench sheets and entered into a database or spreadsheet electronic data deliverable (EDD) for submittal to the ESAT Project Data Manager. Section B.4.2 provides detailed information on the requirements for laboratory documentation and records. Laboratory data management is discussed in detail in Section B.9.3.

A.9.4 Logbooks and Records of Modification

It is the responsibility of field, Troy SPF, and analytical laboratory staff to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures. Significant deviations (i.e., those that impact or have the potential to impact confirmation sampling objectives) from this QAPP, or procedures referenced herein governing sample handling, will be discussed with the EPA RPMs (or their designee) and the EC's Project Manager prior to implementation. Such deviations will be recorded on a Record of Modification (ROM) form[2]. Sections B.5.1.2, B.5.2.2, and B.5.3.2 provide detailed information on the procedures for preparing and submitting ROMs by field, Troy SPF, and analytical laboratory personnel, respectively.

A.9.5 QAPP Revision

As described in Sections A.9.4, B.5.1.2, B.5.2.2, and B.5.3.2, ROM forms will be used to document significant deviations from, or changes to, this QAPP. At the discretion of BNSF and the EC Project Manager, in consultation with the EPA, substantive changes may require a QAPP revision instead of a ROM form. EPA approval of ROM forms is required prior to

[2] The current version of the field ROM form is provided in the OU6-specifc eRoom; current versions of the Troy SPF and laboratory ROM forms are provided in the Libby Lab eRoom.

implementation. Approved ROM forms will be provided to all personnel on the distribution list in Section Distribution List - A3.

All remaining sample matrix, as well as, electronic and hard copy records will be retained for a minimum of ten years. Permission will be granted by the EPA and BNSF before samples or records are disposed.

Section B: Quality Assurance Project Plan

B.1. Study Design

B.1.1 Locations

Figure B-1 identifies the location of the Site. Figure B-2 identifies the OU boundaries for the Site and Figures B-3 shows where investigation has been completed along the ROW, versus where confirmation sampling has been requested. Figures B-6 and B-7 identify the ROW Confirmation and Non-operating Property Confirmation Sampling Areas, respectively, where surface soil sampling activities will be conducted.

B.1.2 Sampling Design

Detailed information on confirmation sampling procedures and methods are presented in Section B.2.

B.1.3 Study Variables

As per the ROD (EPA 2016), the term "surface soil" is used to describe soil that would be encountered by human receptors under "typical" activities. "Typical" activities conducted by BNSF along the ROW (grading, ditching, track maintenance) are not likely to disturb soils to a depth greater than 6 inches below ground surface (bgs). Therefore, surface soil composite samples will be collected at depths between 0 inches and 6 inches bgs, which is also consistent with soil sampling procedures used during the soil sampling efforts completed in 2008. Asbestos concentrations in surface soil can be heterogeneous; therefore, it is important that surface soil sampling methods provide an even and representative coverage of the ROW and Non-operating Confirmation Sampling Areas. To accomplish the goal of characterizing the ROW and Non-operating Confirmation Sampling Areas, each composite sample will consist of 30 aliquots.

Composite samples will *typically* be collected within an approximate 1,000-linear foot sample area centered on the railroad track; some sample areas will be representative of less than 1,000-linear feet (discussed below). Each composite sample area will consist of 30 discrete sample aliquots. To the extent feasible and where safe conditions allow, one-half of the 30 soil aliquots will be collected from each side of the tracks as shown on Figure B-5. If safe surface soil sampling conditions do not exist at the prescribed aliquot location, an alternate sampling location will be established on the opposite side of the tracks from the unsafe location, as shown on Figure B-5. If safe surface soil sampling conditions are not present on the opposite side of the tracks, the aliquot location will be moved to the first available location where safe conditions exist and as close to the target sample location as possible.

As shown on Figure B-4, the ROW Confirmation Sampling Area is divided into three continuous sampling areas: between railroad MP 1301 to 1312, MP 1320 to 1336.33, and MP 1336.58 to 1342. Additional composite surface soil samples will be collected from the Non-Operating Property Confirmation Sampling Area. The following table summarizes the anticipated number of composite surface soil samples to be collected:

Table B-1: Summary of Anticipated OU6 Composite Surface Samples

ROW Confirmation Sampling Area	Anticipated Composite Samples
BNSF MP 1301 to 1312	68
MP 1320 to 1336.33	85
MP 1336.58 to 1342	33
Non-Operating Property Confirmation Sampling Area	
BNSF-owned land abutting the Libby Amtrak Depot	4
BNSF-owned land above the Troy Tunnel	3
Field Duplicate Samples	
MP 1301 – MP 1312	7
MP 1320 – MP 1336.33	9
MP 1336.58 – MP 1342	3
Total Composite Confirmation Samples (including duplicates):	212

Details regarding sample collection are discussed further in Section B.2.2.

B.1.4 Critical Measurements

As previously mentioned, the two primary objectives of this confirmatory sampling effort are to:

1. Determine whether LA concentrations in soil on BNSF-owned property within OU6 exceed the Transportation Corridor RAL.

2. Compare surface soil data, collected as part of this confirmatory sampling effort, to the Transportation Corridor RAL, to determine if remedial actions consisting of institutional controls will be sufficiently protective of receptors in OU6 or whether physical cleanup actions will be required.

The analysis of LA may be achieved using several different types of methods. For this confirmation sampling effort, all surface soil samples (including field duplicate samples) will be analyzed for asbestos by the PLM-VE and the PLM gravimetric method (PLM-Grav) in accordance with project-specific SOPs SRC-LIBBY-03 and SRC-LIBBY-01, respectively[3]. These methods were selected to maintain consistency with past surface soil sampling results, and to allow comparison to, the Transportation Corridor RAL.

B.1.5 Data Reduction and Interpretation

Data collected as part of this confirmation sampling will be compared to the Transportation Corridor RAL to determine whether the selected remedy will be sufficiently protective for receptors in OU6 or whether physical cleanup actions will be required. See Section B.5.1.2 for

[3] The current version of each project-specific analysis SOP is provided in the Libby Lab eRoom.

information regarding the evaluation of data collected under this QAPP as it relates to the DQOs in Appendix A.

B.2 Sampling Methods

This section summarizes field activities that will be performed in support this confirmation sampling effort. This section also provides brief summaries of SOPs, including investigation-specific modifications, where applicable, and confirmation sampling-specific details not discussed in the SOPs. For comprehensive H&S information, field personnel will refer to the SOPs included in Appendix B. H&S protocol for this confirmation sampling effort is provided in the Kennedy/Jenks Consultants HSP.

Sampling activities will be performed in accordance with this QAPP. The specific procedures that will be employed, to the extent they apply to the ROW and Non-operating confirmation sampling efforts, are located in Appendix B and listed below:

- Field Logbook Content and Control (SOP EPA-LIBBY-2012-01)
- Photographic Documentation of Field Activities (SOP EPA-LIBBY-2012-02)
- Field Equipment Decontamination (SOP EPA-LIBBY-2012-04)
- Handling Investigation-derived Waste (IDW) (SOP EPA-LIBBY-2012-05)
- Sample Custody (SOP EPA-LIBBY-2012-06)
- Packaging and Shipping Environmental Samples (SOP EPA-LIBBY-2012-07)
- Completion of Field Sample Data Sheets (SOP CDM-LIBBY-03)
- 30-Point Composite Sampling of Surface Soil for Asbestos (CDM-LIBBY-05)
- Operable Unit 6 Right-of-Way Confirmation Surface Soil Sampling – 30-Point Composite Sampling of Surface Soil for Asbestos
- Operable Unit 6 – Sampling of Surface Soil Containing Visible Vermiculite
- Global Positioning System (GPS) Coordinate Collection and File Transfer Process (SOP CDM-LIBBY-09)
- Global Positioning System (GPS) Coordinate Collection and Handling (Addendum to CDM-Libby-09)
- Libby Chain-of-Custody Documentation (SOP ER8-LIBBY-01)
- Standard Operating Procedure for PLM Data Review and Data Entry Verification (EPA-Libby-10 [Revision 0])
- Validation of PLM Data Deliverables *(*SOP QATS-70-094-01)

- Validation of PCM Data Deliverables (SOP QATS-70-096-02)

The following sections summarize field activities that will be performed during the implementation of the confirmation sampling efforts described in this QAPP.

Analytical methods for all samples collected in accordance with this QAPP are discussed in Section B.4.

B.2.1 Field Preparation

B.2.1.1 Field Team Training

Prior to conducting field activities, field team members must complete the following, at a minimum:

- Read the Site-specific Kennedy/Jenks Consultants HSP
- Attend an orientation session with A&E's onsite H&S officer
- Read and understand all relevant governing documents
- Attain OSHA 40-hour HAZWOPER certification and relevant 8-hour refresher course certifications
- Attain respiratory protection course certification as required by 29 CFR 1910.134
- Attain asbestos awareness course certification as required by 29 CFR 1910.1001
- Attain BNSF Contractor Safety, ERailSafe and Roadway Worker Protection certifications
- Complete training on sample collection techniques to the satisfaction of the Field Team Leader (FTL).

Documentation of trainings/certifications will be stored in the Libby project files located at the EC's Whitefish, Montana project office.

B.2.1.2 Field Planning Meeting (Internal Review)

Prior to beginning field activities, an internal field planning meeting (FPM) will be conducted by the EC's FTL, which will be attended by the field team members conducting the work, a member of the EC's QA staff, a member of the EC's H&S staff, and the BNSF PM. The agenda, prepared by the FTL, will be reviewed and approved by QA and H&S staff prior to the FPM. The FPM will briefly address and clarify:

- Documents governing fieldwork that must be in the field
- Changes in the governing documents
- Objectives and scope of the fieldwork

- Equipment and training needs
- Field operating procedures, schedule of events, and individual assignments
- Required QC measures
- H&S requirements
- BNSF-specific H&S requirements and procedures.

During the FPM, copies of the agenda will be distributed and an attendance list will be circulated for signature. The agenda and the completed attendance list will be maintained in the EC's project files. Additional meetings will be held if major changes to the documents governing fieldwork occur, or the scope of the assignment changes significantly.

Field team members will perform the following activities before and during field activities, as applicable:

- Review and understand applicable governing documents
- Record appropriate levels of documentation regarding activities conducted
- Ensure coordination between key staff, such as the A&E's sample coordinator and the project's removal contractor
- Obtain required sample containers and other supplies
- Obtain, check, and calibrate field sampling equipment
- Obtain and maintain personal protective equipment (PPE)
- Coordinate with BNSF Roadmaster to obtain track protection.

B.2.1.3 Field Planning Meeting (External Review)

Following completion of the FPM, an external field planning meeting will be conducted to include project personnel from EPA, DEQ, USACE, CDM Smith, CB&I, BNSF and the EC, as determined by the EPA PM. The EC will develop and circulate an agenda prior to the meeting, which may include the following discussion points (at a minimum):

- Project staff introductions
- Sampling logistics, work progression, and schedule
- On-track safety procedures during oversight
- Communication methods
- Sample custody and transportation logistics

- Laboratory coordination
- Libby-specific training schedule and location.

During the external field planning meeting, copies of the agenda will be distributed and an attendance list will be circulated for signature. The agenda and the completed attendance list will be maintained in the EC's project files. Additional meetings will be held if major changes to the documents governing fieldwork occur, or the scope of the assignment changes significantly.

B.2.1.4 Inventory and Procurement of Equipment and Supplies

An inventory of project-procured equipment and supplies will be conducted by the FTL prior to field work. Any additional required equipment or supplies will be procured. Acceptance of equipment, as pertinent, will be verified according to SOP EPA-LIBBY-2012-03, Control and Measurement and Test Equipment (see Appendix B). The following equipment is required for sampling activities conducted under this QAPP:

- Field logbooks
- Indelible ink pens
- Digital camera with memory card
- Sample paperwork and sample labels
- Custody seals
- Plastic zip-top bags
- Surface soil sampling equipment
- GPS unit(s) (e.g., Trimble® GeoXT or equivalent)
- PPE as required by the Site-specific HSP
- Measuring wheel/tape
- Land survey and/or aerial photograph.

B.2.2 Sample Collection

This section describes the sampling methods and procedures that will be used to complete this confirmation sampling effort.

B.2.2.1 Surface Soil Sampling

ROW Confirmation Surface Soil Sample Collection Methods

Surface soil samples collected within the ROW Confirmation Sampling Area will be in general accordance with Operable Unit 6 30-Point Composite Sampling of Surface Soils for Asbestos(Appendix B) and summarized below:

- Approximately 186 composite samples (not including field QC samples) will be collected throughout the ROW Confirmation Surface Soil Sampling Area. Land use within this sampling area has been categorized as a limited use area (LUA). Each composite surface soil sample will be representative of a 1,000-foot interval of the ROW or a maximum sample area of 217,800 square feet (5 acres) (Table B-3, USACE 2016). Each ROW composite surface soil sample and will consist of 30 discrete surface soil aliquots. Approximately one-half of the soil aliquots will be collected from each side of the tracks, where safe conditions exist (see example composite sample collection plan on Figure B-5).

- Soil aliquots will be collected using a spade or hand auger. Soil aliquots will be collected between the ground surface and a maximum depth of 6 inches bgs. If penetration to a depth of 6 inches bgs is not possible, the achieved sample interval will be noted in the field book.

- The sampler will add approximately equal soil volumes from each aliquot collection location to a zip-top plastic bag. Each completed sub-composite sample will be thoroughly homogenized by hand in a sealed zip-lock bag and have a minimum weight of 500 grams and a maximum of 1,000 grams, roughly equivalent to a one-half full gallon zip-top plastic bag.

Collection of field QC samples, which are set at a frequency of one per 20, is discussed in Section B.2.3.

Non-Operating Property Confirmation Surface Soil Sample Collection Methods

Surface soil samples collected from Non-Operating Properties will be in general accordance with CDM-Libby-05 (Revision 5) 30-point Composite Sampling of Surface Soils for Asbestos (Appendix B) and summarized below:

- It is anticipated four 30-point composite surface soil samples will be collected from the BNSF-owned land abutting the Libby Amtrak Depot. Land use within this sampling area is divided into two categories; specific use area (SUA) and common use area (CUA). Sampling areas covered with an impermeable surface (e.g., asphalt, concrete) will be excluded from sampling. Each composite soil sample will be representative of 43,560 square feet (1 acre) or less (Table B-3, USACE 2016). Sample collection and land use areas are illustrated in Figure B-6.

- It is anticipated three 30-point composite surface soil samples will be collected from the portions of BNSF-owned property, above the Troy Tunnel, where land use is categorized as a SUA. Each composite surface soil sample will be representative of 43,560 square feet (1 acre) or less. Portions of the BNSF-owned land above the Troy Tunnel, where

land use is categorized as non-use areas (NUAs) will not be sampled. Sample collection and land use areas are illustrated in Figure B-7.

- Soil aliquots will be collected using a spade or hand auger. Soil aliquots will be collected between the ground surface and a maximum depth 6 inches bgs, regardless of land use classification. If maximum target depth cannot be achieved, the achieved sample interval will be noted in the field book.

- The sampler will add approximately equal soil volumes from each aliquot collection location to a zip-top plastic bag. Each completed composite sample will have a minimum weight of 500 grams and a maximum of 1,000 grams, roughly equivalent to a one-half full gallon zip-top plastic bag.

Collection of field QC samples, which are set at a frequency of one per 20, are discussed in Section B.2.3.

B.2.2.2 Visual Vermiculite Inspection and Sampling

Visual Vermiculite Inspection

Prior to the start of field activities each field team member will be trained by EPA contractors to observe, and visually estimate visible vermiculite (VV). During the course of surface soil sampling, all field team members will observe surface soil conditions within OU6 for VV. When an area of VV is observed, the field team will determine the approximate extent of VV, photograph the general area for future reference and record location coordinates using the hand-held GPS unit. Information regarding the extent and location of the VV area will be recorded in the field notebook. Areas of VV will not be included in confirmation samples collected within the ROW or Non-operating Confirmation Sampling Areas, but will be sampled separately (discussed below).

Visual Vermiculite Sampling

Following the completion of sampling in the ROW and Non-Operating Property Confirmation Sampling Areas, occurrences of VV will be compiled, and sampled according to the Sampling of Surface Soil Containing Visible Vermiculite SOP (Appendix B), which is summarized below:

- If the extent of VV less than or equal to 500 square feet at any of the land use areas, a discrete sample will be collected at the land use area-specific sampling depth increment specified in Table 5.1 in the SOP.

- One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations within the BNSF ROW Confirmation Sampling Area where VV is present over an area greater than 500 square feet and up to 217,800 square feet. One additional 30-point composite surface soil sample will be collected for each additional 217,800 square feet of VV.

- One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations within unpaved parking lot/drive aisles of the Libby Amtrak Depot within the BNSF property boundary where VV is present over an area greater than 500 square

feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected, as necessary, for each additional 43,560 square feet of VV.

- One 30-point composite surface soil sample will be collected between 0 and 3 inches bgs at locations adjacent to the Libby Amtrak Depot and within the BNSF property boundary where VV is present over an area greater than 500 square feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected, as necessary, for each additional 43,560 square feet of VV.

- One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations in the landfill area above the Troy Tunnel and within the BNSF ROW where VV is present over an area greater than 500 square feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected for each additional 43,560 square feet of VV.

Collection of field QC samples, which are set at a frequency of one per 20, are discussed in Section B.2.3.

B.2.3 Field Quality Control Samples

Field QC samples associated with surface soil samples are field duplicates. These samples are discussed in this section and summarized in Table B-1.

Field duplicate samples will be collected at a rate of one per 20 field samples collected. A total of 19 field duplicates samples are anticipated to be collected; seven will be collected between MP 1301 and MP 1312; nine will be collected between MP 1320 and MP 1336.33; and three will be collected between MP 1336.58 and MP 1342. Due to the low number of samples to be collected in the Non-operating Property Confirmation Sampling Area no field duplicate samples are anticipated to be collected. The number of field duplicate samples collected during VV sampling will be dependent on the number of areas of VV located and sampled, but will be at the rates specified below in Table B-2. Surface soil field duplicate aliquots will be collected immediately adjacent to the parent aliquot sample locations. Therefore, the field duplicate will reflect the representativeness of the sampling approach. There is currently no acceptance criteria established for soil field duplicates. Field duplicate sample results may be used preferentially to the field sample results (for the same area) for decision making. Additionally, laboratory QC sample results may also be used preferentially to the field sample results for decision making. The FTL or designee is responsible for maintaining surface soil field duplicate sample collection frequencies.

Table B-2: Summary of Field QC Samples

Sample Type	Associated QC Sample	Collection Frequency	Analysis Frequency	Analysis Request
Surface Soil	field duplicate	1 per 20 field samples	100%	PLM-VE/PLM-Grav

Notes:

PLM-Grav – polarized light microscopy gravimetric method.

PLM-VE – polarized light microscopy visual area estimation method.

B.2.4 General Processes

This section describes the general field processes that will be used to support the sampling described in this QAPP and includes references to the Site-specific SOPs and project-specific procedures when applicable.

B.2.4.1 Equipment Decontamination

Decontamination of reusable field equipment will be conducted in accordance with SOP EPA-LIBBY-2012-04, Field Equipment Decontamination (see Appendix B) with the following exceptions:

- Brushing is only required if visible soil remains after rinsing equipment.
- Air drying decontaminated equipment is not required prior to use.

Materials used in the decontamination process will be disposed of as IDW as described below. Re-usable sampling equipment will be rinsed before and after sample collection (not between each aliquot) and is not required to be wrapped in plastic or foil between uses.

B.2.4.2 Investigation-Derived Waste

IDW will consist of spent decontamination supplies and PPE. No excess surface soil sample volume is expected to be generated. All IDW will be handled in accordance with SOP EPA-LIBBY-2012-05, Handling Investigation-Derived Waste (see Appendix B). In brief, IDW will be double-bagged in clear 6-mil poly bags with 'IDW' written in indelible ink on the outer bag. All IDW generated during this confirmation sampling effort will remain in the custody of the field team, or locked in a storage area, until it can be entered into the waste stream at the local class IV asbestos landfill.

B.3 Samples and Locations

B.3.1 Field Documentation

In accordance with EPA project records retention requirements, all hard copy and electronic field documentation generated by the EC as part of this confirmation sampling effort will be retained at the EC Whitefish field office until relinquished to the EPA.

B.3.1.1 Field Sample Data Sheets

A field sample data sheet (FSDS) will be completed for each surface soil sample and in accordance with SOP CDM-LIBBY-03, *Completion of Field Sample Data Sheets* (see Appendix B) and summarized below.

Use of standardized forms ensures consistent documentation across samplers. Current versions of media-specific FSDSs will be provided by CDM. FSDSs are location-specific and allow for the entry of up to three individual samples from the same property on the same FSDS form. If columns are left incomplete due to fewer than three samples being recorded on a sheet, the blank columns will be crossed out, dated, and signed by the field team member completing the FSDS. Erroneous information recorded on a hard copy FSDS will be corrected with a single

line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

An event ID will be recorded on each FSDS to identify the protocol used for the inspection(s) or sample(s) recorded on that FSDS. Samples collected during this confirmation sampling effort will use BG-070016 as the event ID.

A unique alphanumeric code, or location ID, will identify each location sampled during activities. The coding system will provide a tracking record to allow retrieval of information about a particular location and to ensure that each is uniquely identified. Location IDs will be sequential and will be recorded on the FSDS. For locations where a sample was collected, both the location ID and sample ID will appear on the FSDS.

FSDS information will be completed in the field before field personnel leave the sampling location. To ensure that all applicable data are accurately entered and all fields are complete, a different field team member will check each FSDS. The team member completing the hard copy form and the team member checking the form will initial the FSDS in the proper fields. In addition, the FTL will also complete periodic checks of FSDSs prior to relinquishment of the samples to the field sample coordinator. Once FSDSs and samples are relinquished to the field sample coordination personnel, the FSDSs are checked for completeness as data are input into the local Scribe field database. Field sample coordination personnel also conduct an independent check of entered data for accuracy and completeness.

If a revision is required to the hard copy FSDS during these checks, it will be returned to the field team member initially responsible for its completion. The error will be explained to the team member and the FSDS corrected. If the team member is no longer at the Site, revisions will be made by the FTL, or designee. It is the responsibility of the CDM Smith Field Data Manager to make the appropriate change in the local Scribe field database.

Each hard copy FSDS is assigned a unique sequential number. This number will be referenced in the field logbook entries related to samples recorded on individual sheets. EC field administrative staff will manage the hard copy FSDSs in the EC project office.

B.3.1.2 Sample Identification

Samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. The labels will be affixed to the inside of both the inner and outer sample bags and the sample ID number will be written in indelible ink on the outside of each bag.

Sample ID numbers will identify the samples collected during this sampling effort using the following format:

BG-00001

Where:

BG = EPA assigned prefix designating samples collected under this QAPP

00001 = A sequential five-digit number assigned to each 1,000 foot composite sample, numbered from east to west.

B.3.1.3 Field Logbooks

The field logbook is an accounting of sampling activities and will duly note problems or minor deviations from this QAPP. Field logbook entries will be recorded in accordance with SOP EPA-LIBBY-2012-01, Field Logbook Content and Control (see Appendix B). Sample details will be recorded on an FSDS and FSDS numbers will be recorded in the logbook.

EC field administrative staff will manage the field logbooks by assigning unique identification numbers to each field logbook, tracking to whom and the date each field logbook was assigned, the type of activities recorded in each field logbook (i.e., OU6 Confirmation Surface Soil Sampling), and the date when the field logbook was returned. As field logbooks are completed, originals will be catalogued and maintained in the EC project office. Scanned copies of field logbooks will be maintained on the EC's project server, which is backed up daily to an offsite location.

B.3.1.4 Photographic Documentation

All photographic documentation will be in accordance with SOP EPA-LIBBY-2012-02, *Photographic Documentation of Field Activities* (see Appendix B). Captions are not required for photographs taken as part of this QAPP.

Photographs will be taken with a digital camera at places that field personnel deem necessary. Electronic photograph files will be saved each day to the EC's server located at the project office (backed up daily to an offsite location), and named so photographs for a particular property or activity can easily be retrieved. The photograph file naming convention for photos collected under this QAPP is as follows:

ROW_YYYYMMDD_XXX

Where:

ROW = the sampling area where activities occurred and photograph was taken, where ROW indicates right-of-way, TUN indicates Non-operating property above the Troy Tunnel, DPT indicates Non-operating property abutting the Amtrak Depot and VVS indicates visible vermiculite sampling.

YYYYMMDD = Four digit year, two digit month, and two digit day.

XXX = three digit number of the photograph taken

Example:

For the 22nd photo taken during ROW Confirmation Sampling on 22 July 2016, the photograph file name would be:

ROW-20160722-022

Following completion of sampling activities, all photographic files pertaining to a property will be copied to the EC server along with other property-specific documentation. Pertinent photographic files will be shared with the EPA through the OU6-specifc eRoom.

B.3.1.5 Change Control

Corrections to field documentation, including FSDSs and logbooks, require a single strikeout of the erroneous information, initials, and date. The corrected information will be entered in close proximity to the existing entry. For revisions to FSDSs, it is the responsibility of sampling staff making the revisions to provide the revised originals to the A&E's sample coordinator for updating corresponding electronic data. Updated FSDS data will be published to Scribe by A&E data management staff promptly in order to meet the EPA reporting requirements.

All deviations from the guiding documents will be recorded in the logbooks by the sampling team or on the Record of Modification to Documents Governing Field Activities by the FTL (see Section B.5.1.2 for specifics).

As noted in Section A.9.5, significant deviations from this QAPP, or procedures referenced herein governing sample handling, will be discussed with BNSF, the EC's Project Manager, BNSF, and the EPA RPMs (or their designee) prior to implementation. Such deviations will be recorded on a ROM.

B.3.1.6 Global Positioning System (GPS) Coordinate Collection

GPS location coordinates will be collected for inspected or sampled locations in accordance with SOP CDM-LIBBY-09 (Revision 5), *GPS Coordinate Collection and Handling* and the Addendum to CDM-Libby-09 (see Appendix B).

Field-collected GPS data are converted to a usable geographic information system (GIS) format using the general processes described in SOP CDM-LIBBY-09. After the conversion from GPS points to GIS files, 100% of the data is checked visually to identify potential data entry errors (e.g., aliquot locations appear on the correct side of tracks).

B.3.1.7 Field Sample Custody

Sample custody and documentation will follow the requirements specified in SOP EPA-LIBBY-2012-06, *Sample Custody* (see Appendix B). In general, all teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. At the end of each day, sampling teams will relinquish samples directly to sample coordination staff or to a designated secure sample storage location. Relinquishment will be documented in the logbook.

B.3.1.8 Chain-of-Custody Requirements

For the Libby project, the chain-of-custody (COC) record is employed as physical evidence of sample custody and condition from the sample coordination team to the receiving facility. A completed COC record is required to accompany each batch of samples, whether it is hand-delivered to the EPA LC or shipped to a processing or analytical facility.

The sample coordination team will produce COC records in accordance with SOP ER8-LIBBY-01, *Libby Chain of Custody Documentation*. Only quality-checked sample information will be used for COC records. In the event electronic systems are unavailable (e.g., due to a power outage), hard copy COC records will be employed. Hard copy COC records will be data-entered as soon as electronic systems are back online.

For hand-deliveries, a sample coordinator will relinquish samples and corresponding COC records to the EPA LC under strict custody. During relinquishment, the sample coordinator will complete the following information in the designated spaces at the bottom of the COC record: signature, company name, date, and time. The EPA LC will also complete the required information and will make a note regarding sample condition (e.g., OK – accept). The sample coordinator will retain the bottom copy of the COC record for the A&E's project record.

B.3.1.9 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with SOP EPA-LIBBY-2012-07, *Packaging and Shipping of Environmental Samples* (see Appendix B). Samples will be hand-delivered to the EPA LC, picked up by a delivery service courier, or shipped by a delivery service to the designated facility or laboratory, as applicable. For hand-deliveries, the sample coordinator will package samples for transit such that they are contained and secure (i.e., will not be excessively jostled). Clean plastic totes with the lids secured or sample coolers may be used for this purpose.

B.3.1.10 Field Equipment Maintenance

Field equipment maintenance will be conducted and documented in accordance with SOP EPA-LIBBY-2012-03, Control of Measurement and Test Equipment (see Appendix B).

B.3.2 Holding Times

For the samples specified for collection in this QAPP, no holding time requirements will be employed.

B.3.3 Archival and Final Disposition

All soil samples and air sample filters will be maintained in storage at the Troy SPF, analytical laboratory, or fire cache sample storage facility, unless otherwise directed by the EPA. When authorized by the EPA, the laboratory will be responsible for proper disposal of remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

B.4 Analytical Methods and Operations

The EPA will be responsible for all sample analysis, including sample processing prior to analysis. The EC will be responsible for relinquishing all samples to the EPA LC, or processing facility or laboratory as designated by the EPA LC. The A&E sample coordinator will also be responsible for communicating with the EPA LC to relay pertinent sample and analysis

information including sample quantities; special sample handling requirements, processing, or analysis concerns; and requested turn-around times.

This section discusses the analytical methods, custody and documentation procedures, QA/QC requirements, and data management requirements to be employed by the laboratory in support of this QAPP.

B.4.1 Analytical Methods and Turnaround Times

This section describes the analytical methods used for samples collected under this QAPP.

An analytical requirements summary sheet (see Appendix C) specific to sampling activities associated with this QAPP will be submitted to EPA and reviewed by Talena, prior to distribution to the participating laboratories for review and approval.

The A&E's sample coordinator will provide the EPA LC with requested turn-around times for all samples relinquished. In general, it is expected that analysis, including soil preparation, for all surface soil samples will be complete within 45 (business) days. Air samples will be specified for 72-hour turnaround time.

B.4.1.1 PLM-VE/PLM-Grav – Soil Samples

Prior to analysis, all surface soil samples require processing. Surface soil samples will be processed using the current version of the Libby soil sample processing SOP 16-ASB-06.00. The A&E will indicate the current version of the soil sample processing SOP in the analysis request section of the COC record. It is the responsibility of the soil preparation facility to specify the appropriate PLM method as it corresponds to the specific sample fraction being submitted for analysis (i.e., fine ground or coarse fraction) on their COC records to the laboratory.

All surface soil samples collected as part of this effort, including field duplicate samples, will be analyzed for asbestos by PLM-VE and PLM-Grav in accordance with SOPs SRC-LIBBY-03 and the most recent version of Libby laboratory modifications LB-000097, LB-000098 and SRC-LIBBY-01 with laboratory modifications LB-000073, LB-000088, respectively.

B.4.1.2 Health and Safety Air Samples

Personal air samples will be collected for health and safety monitoring and will be prepared and analyzed by PCM in accordance with NIOSH Method 7400, Issue 2, and the most recent version of Libby Laboratory Modification LB-000015. Upon Request from EPA, personal air samples may be analyzed by TEM (EPA 1987) and the most recent version of Libby Laboratory modifications LB-000029, LB-000031, LB-000067, LB-000085, and LB-000091.

B.4.2 Analytical Data Reports

An analytical data report will be prepared by the laboratory and submitted to the appropriate LC after the completion of all required analyses within a specific laboratory job (or sample delivery group). This analytical data report includes a case narrative that briefly describes the analytical methods, deviations from the methods, revisions to data reports, COC discrepancies, etc. The data report also includes copies of the signed COC forms, sample preparation logs, and analytical benchsheets. The data report may also include spectra print outs, grid sketches,

instrument preparation logs, instrument print outs, instrument maintenance records, analysis run logs, etc. The laboratory provides an electronic scanned copy of the analytical data report to the LC and others, as directed by the LC.

B.4.3 Laboratory Data Reporting Tools

Standardized data reporting tools (i.e., EDDs) have been developed specifically for the Libby project to ensure consistency between different laboratories in the presentation and submittal of analytical data. In general, unique Libby-specific EDDs have been developed for each analytical method and each medium. Since the beginning of the Libby project, each EDD has undergone continued development and refinement to better accommodate current and anticipated future data needs and requirements. EDD refinement continues based on laboratory and data user input.

For PLM analyses, optical property details and results will be recorded on the Libby-specific EDDs for PLM. Standard project data reporting requirements will be met for PLM analyses. EDDs will be a local FTP site maintained by the ESAT project data manager and transmitted electronically (via email) to the following:

- Doug Kent, Kent.Doug@epa.gov
- Janelle Lohman, Lohman.Janelle@epa.gov
- Scott Carney, ScottCarney@KennedyJenks.com
- Lauren Knickrehm, LaurenKnickrehm@KennedyJenks.com
- Valerie Kull, ValerieKull@KennedyJenks.com
- Andrea Wandler (TechLaw), awandler@techlawinc.com
- Libby project email address for CDM Smith, libby@cdmsmith.com.

ESAT has developed a Site-specific analytical results reporting tool, referred to as the Libby Asbestos Data Tool (LADT). This tool is a relational Microsoft® Access database with a series of standard data entry forms specific to each analytical method. The LADT creates a Microsoft® Excel export file that can be directly uploaded into an analytical Scribe project database (see Section B.9.4). Currently, LADT is only utilized by the ESAT laboratory for entry of PLM analytical results. Other laboratories continue to use Libby-specific EDDs as described above.

B.4.4 Custody Procedures

Laboratory custody procedures are provided in the QA management plans for each laboratory. These plans were independently audited and found to be satisfactory by the EPA's laboratory audit team.

The basic laboratory sample custody process is as described herein. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying

COC record will be cross-referenced with all of the samples in the shipment. The laboratory sample custodian will sign the COC record and maintain a copy for their project files; the original COC record will be appended to the hard copy data report. Next, the sample custodian may assign a unique laboratory number to each sample on receipt. This number will identify the sample through all further handling at the laboratory. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, data reporting, and sample archiving.

B.5 Quality Assurance/Quality Control

B.5.1 Field

Field QA/QC activities include all processes and procedures that have been designed to ensure that field samples are collected and documented properly, and that issues/deficiencies associated with field data collection or sample processing are quickly identified and rectified.

B.5.1.1 Training

Before performing field work in Libby, field personnel are required to read all governing field guidance documents relevant to the work being performed and attend a field planning meeting specific to sampling efforts described in this QAPP. Additional information on field training requirements is provided in Section A.8.1.

B.5.1.2 Modification Documentation

All major field deviations from and modifications to this QAPP will be recorded on the Libby field ROM Form. The field ROM forms are available in OU6-specific eRoom and will be used to document all permanent and temporary changes to procedures contained in guidance documents governing confirmation sampling work that have the potential to impact data quality or usability. ROMs will not be implemented until approved by USACE and the EPA. See Section A.9.5 for details incorporating deviations from ROM forms during QAPP revision.

Minor deviations (i.e., those that will not impact data quality or usability) will be documented in the field logbooks. ROMs are completed by the FTL overseeing the confirmation sampling /activity, or by assigned field or technical staff. As modifications to governing documents are implemented, the FTL will communicate the changes to the field teams conducting activities associated with the modification.

Each completed field ROM is assigned a unique sequential number (e.g., OU6-000026) by the EC's project QAM. A ROM tracking log for all field modifications is also maintained by the QAM. This tracking log briefly describes the ROM being documented, as well as ROM author, the reviewers, and date of approval. Once a form is prepared, the EC's project QAM will submit it to BNSF for approval, and subsequently submit it to the appropriate EPA RPM for review and approval. Approved field ROMs are maintained on the EC's project server, and the EC PM will post them to the OU6-specific eRoom.

B.5.1.3 Field Surveillances

Field surveillances consist of periodic observations made to evaluate continued adherence to confirmation sampling -specific governing documents. It is anticipated EPA or EPA contractors

will conduct field surveillance during the early stages of this sampling effort. Additional field surveillance may be conducted if field processes are revised or other QA/QC procedures indicate potential deficiencies.

B.5.1.4 Field Audits

Field audits are broader in scope than field surveillances. Audits are evaluations conducted by qualified technical or QA staff that are independent of the activities audited. Field audits can be conducted by field contractors, internal EPA staff, or EPA contracted auditors. It is the responsibility of the EPA RPM to ensure that field auditing requirements are met for each investigation. EPA has not indicated field audits will be performed during this study.

B.5.1.5 Field QC Samples

Field QC samples are typically collected to help ensure that field samples are not contaminated from exogenous sources during sample collection, and to help evaluate the precision of field sample analytical results. Field QC samples are assigned unique field IDs and are submitted to the analytical laboratory along with the associated field samples. For this confirmation sampling effort, field duplicate surface soil samples will be collected as described in Section B.2.3.

B.5.2 Troy SPF

Prior to shipment to a laboratory for analysis, surface soil samples will be prepared at the Troy SPF. The sections below provide detailed information on QA/QC procedures for the Troy SPF, which is maintained by adherence to standard preparation procedures, submission of preparation QC samples, facilities monitoring, and audits.

B.5.2.1 Training/Certifications

Personnel performing sample preparation activities must have read and understood the Soil Sample Preparation Work Plan (TechLaw, Inc. 2007)[4], the SPF HASP, and all associated SOPs and governing documents for soil preparation (e.g., SOP 16-ASB-06.00). In addition, all personnel must have completed 40-hour OSHA HAZWOPER training, annual updates, annual respirator fit tests, and annual or semi-annual physicals, as required.

Prior to performing activities at the Troy SPF, new personnel will be instructed by an experienced member of the SPF staff and training sessions will be documented in the SPF project files. It is the responsibility of the SPF QAM to ensure that all personnel have completed the required training requirements.

B.5.2.2 Modification Documentation

When changes or revisions are needed to improve or document specifics about sample preparation procedures used by the Troy SPF, these changes are documented using an SPF ROM form. The SPF ROM form provides a standardized format for tracking procedural changes in sample preparation and allows project managers to assess potential impacts on the quality of the data being collected. SPF ROMs will be completed by the appropriate SPF or technical staff. Once a form is prepared, it is submitted to the ESAT QAM (or their designee) for review. Final

[4] At the time of this QAPP, this work plan is currently being updated.

review and approval is provided by the appropriate EPA RPM. Copies of approved SPF ROMs are available in the Libby Lab eRoom.

B.5.2.3 Soil Preparation Facility Audits

Internal audits of the SPF are conducted by the SPF QAM periodically to evaluate personnel in their day-to-day activities and to ensure that all processes and procedures are performed in accordance with governing documents and SOPs. All aspects of sample preparation, as well as sample handling, custody, and shipping are evaluated. If issues are identified, SPF personnel are notified and retrained as appropriate. Audit reports will be completed following each laboratory audit. A copy of the internal audit report, as well as any corrective action reports, will be provided to the LC and the QATS contractor.

Internal audits will be conducted following significant procedural changes to the soil preparation processes or other SPF governing documents to ensure the new methods are implemented and followed appropriately.

The Troy SPF is also required to participate in an annual onsite laboratory audit carried out by the EPA through the QATS contract. Audits consist of an evaluation of facility practices and procedures associated with the preparation of soil samples. A checklist of requirements, as derived from the applicable governing documents and SOPs, is prepared by the auditor prior to the audit, and used during the on-site evaluation. Evaluation of the facility is made by reviewing SPF documentation, observing sample processing, and interviewing personnel.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report following the SPF audit. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each SPF to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the onsite audit findings and recommendations. The purpose of this report is to identify SPF performance problems and isolate the potential causes.

B.5.2.4 Preparation QC Samples

Three types of preparation QC samples are collected during the soil preparation process: sand blanks, drying blanks, grinding blanks, and preparation duplicates. Each type of preparation QC sample is described in more detail below.

Sand Blank

A sand blank is a sample of store-bought quartz sand that is analyzed to ensure that the quartz sand matrix used for drying and grinding blanks is asbestos-free. Detailed procedures for this certification process are provided in ESAT SOP PLM-02.00, *Blank Sand Certification by Polarized Light Microscopy*. In brief, about 800 grams of sand are split into 40 sand blank aliquots of roughly equal size. Each sand blank is evaluated using stereomicroscopic examination and analyzed by PLM-VE. If a sand blank has detected asbestos, it is re-analyzed by a second PLM analyst to verify the presence of asbestos. The sand is certified as asbestos-free if all 40 sand blanks are non-detect for asbestos. The sand is rejected for use if any

asbestos is detected in the sand blanks. Only sand that is certified as asbestos-free will be utilized in the SPF.

Drying Blank

A drying blank consists of approximately 100 to 200 grams of asbestos-free quartz sand that is processed with each batch of field samples that are dried together. The drying blank is then processed identically to field samples. Drying blanks determine whether cross-contamination between samples is occurring during sample drying. One drying blank will be processed with each drying batch per oven. It is the responsibility of the SPF QAM to ensure that the appropriate number of drying blanks is collected. Each drying blank is given a unique sample number that is investigation-specific, as provided by the field sample coordinator (i.e., a subset of sample numbers for each investigation will be provided for use by the SPF). SPF personnel will record the sample number of the drying blank on the sample drying log sheet.

It is the responsibility of the QATS contractor to review the drying blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If asbestos is detected in the drying blank, a qualifier of “DB” will be added to the related field sample results in the project database that were dried at the same time as the detected drying blank to denote that the associated drying blank had detected asbestos. In addition, the drying oven will be thoroughly cleaned. If asbestos continues to be detected in drying blanks after cleaning occurs, sample processing must stop and the drying method and decontamination procedures will be evaluated to rectify any cross-contamination issues.

Grinding Blank

A grinding blank consists of asbestos-free quartz sand and is processed along with the field samples on days that field samples are ground. Grinding blanks determine whether decontamination procedures of laboratory soil processing equipment used for sample grinding and splitting are adequate to prevent cross-contamination. Grinding blanks are prepared at a frequency of one per grinding batch per grinder per day.

It is the responsibility of the QATS contractor to review the drying blank results and notify the SPF QAM immediately if drying blank results do not meet acceptance criteria and if corrective actions are necessary. If any asbestos is detected by PLM-VE in the grinding blank (i.e., result is not Bin A), a qualifier of “GB” is added to the related field sample results in the project database that were ground at the same time as the detected grinding blank to denote that the associated grinding blank had detected asbestos. In addition, the grinder is thoroughly cleaned. If asbestos continues to be detected in grinding blanks after cleaning occurs, sample processing must stop and the grinding method and decontamination procedures are evaluated to rectify any cross-contamination issues.

Preparation Duplicate

Preparation duplicates are splits of field samples submitted for sample preparation. The preparation duplicates are used to evaluate the variability that arises during the soil preparation and analysis steps. After drying, but prior to sieving, a preparation duplicate is prepared by using a riffle splitter to divide the field sample (after an archive split has been created) into two approximately equal portions, creating a parent and duplicate sample.

Preparation duplicate samples are prepared at a rate of one per 20 samples (5%) of samples prepared. It is the responsibility of the SPF QAM to ensure that the appropriate number of preparation duplicates is prepared. Each preparation duplicate is given unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the preparation duplicate and its associated parent field sample on the sample preparation log sheet. Preparation duplicates are submitted blind to the laboratory for analysis by the same analytical method as the parent sample.

Preparation duplicate results will be evaluated based on a comparison of the reported PLM-VE bin for the parent field sample and preparation duplicate sample. Because preparation duplicate samples may have inherent small-scale variability that is random and may be either small or large, there is no quantitative requirement for the agreement of preparation duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability. The QATS contractor will notify the SPF QAM when preparation duplicate results are different from the parent results to determine if corrective action is needed.

B.5.2.5 Performance Evaluation Standards

The USGS has prepared several Site-specific reference materials of LA in soil that are utilized as performance evaluation (PE) standards to evaluate laboratory accuracy and precision. These PE standards are kept in storage at the Troy SPF and are inserted into the sample train in accordance with SOP 16-ASB-06.00, with the following project-specific modification:

- PE standards will not be processed prior to insertion (i.e., no sieving or grinding of the standard will be performed).

- PE standards of varying nominal levels will be inserted on a quarterly basis at a rate of at least one PE standard per analytical laboratory.

It is the responsibility of the SPF QAM to ensure that the appropriate number of PE standards is inserted. Each PE standard is given a unique sample number that is investigation-specific, as provided by the field sample coordinator. SPF personnel will record the sample number of the PE standard, and the nominal level of the PE standard on the sample preparation log sheet. PE standards are submitted blind to the laboratory for analysis by the same analytical method as the field samples.

Results for PE standards will be evaluated by the QATS contractor or their designee. PE standard results will be evaluated based on the nominal concentration of the PE standard. The LC will be notified if PE standard results do not meet acceptance criteria. Corrective action will be taken if the PE standards demonstrate issues with accuracy and/or bias in results reporting. Examples of corrective actions that may be taken include reanalysis and/or re-preparation, collaboration between and among laboratories to address potential differences in analysis methods, and analyst re-training.

B.5.3 Analytical Laboratory

Laboratory QA/QC activities include all processes and procedures that have been designed to ensure that data generated by an analytical laboratory are of high quality and that any problems in sample preparation or analysis that may occur are quickly identified and rectified. The

following sections describe each of the components of the analytical laboratory QA/QC program implemented at the Site.

B.5.3.1 Training/Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Additional information on laboratory training and certification requirements is provided in Section A.8.2.

Laboratories handling samples collected as part of this confirmation sampling program will be provided a copy of and will adhere to the requirements of this QAPP. Samples collected under this QAPP will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures (i.e., Good Laboratory Practices) in order to provide analytical data of known quality and consistency.

B.5.3.2 Modification Documentation

All deviations from project-specific and method analytical guidance documents, or this QAPP, will be recorded on the laboratory ROM. Deviations that impact, or have the potential to impact, confirmation sampling objectives will be discussed with the OU6 EPA RPM and EC FTL prior to implementation. In addition, the appropriate ROM form will be used to document information of interest as requested by the EPA. As modifications are approved by the EPA and implemented, the EPA LC will communicate the changes to the EPA laboratories. Sample results data will be delivered to the EPA in accordance with the EPA Data Management Plan for the Libby Asbestos Superfund Site (EPA 2015).

B.5.3.3 Laboratory Audits

Each laboratory working on the Libby project is required to participate in an annual onsite laboratory audit carried out by the EPA through the QATS contract. These audits are performed by EPA personnel (and their contractors), that are external to and independent of, the Libby laboratory team members. These audits ensure that each analytical laboratory meets the basic capability and quality standards associated with analytical methods for asbestos used at the Site. They also provide information on the availability of sufficient laboratory capacity to meet potential testing needs associated with the Site.

External Audits

Audits consist of several days of technical and evidentiary review of each laboratory. The technical portion of the audit involves an evaluation of laboratory practices and procedures associated with the preparation and analysis of samples for the identification of asbestos. The evidentiary portion of the audit involves an evaluation of data packages, record keeping, SOPs, and the laboratory QA Management Plan. A checklist of method-specific requirements for the commonly used methods for asbestos analysis is prepared by the auditor prior to the audit, and used during the onsite laboratory evaluation.

Evaluation of the capability for a laboratory to analyze a sample by a specific method is made by observing analysts performing actual sample analyses and interviewing each analyst responsible for the analyses. Observations and responses to questions concerning items on each method-specific checklist are noted. The determination as to whether the laboratory has the capability to analyze a sample by a specific method depends on how well the analysts follow

the protocols detailed in the formal method, how well the analysts follow the laboratory-specific method SOPs, and how the analysts respond to method-specific questions.

Evaluation of the laboratory to be sufficient in the evidentiary aspect of the audit is made by reviewing laboratory documentation and interviewing laboratory personnel responsible for maintaining laboratory documentation. This includes personnel responsible for sample check-in, data review, QA procedures, document control, and record archiving. Certain analysts responsible for method quality control, instrument calibration, and document control are also interviewed in this aspect of the audit. Determination as to the capability to be sufficient in this aspect is made based on staff responses to questions and a review of archived data packages and QC documents.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report for each analytical laboratory participating in the Libby program. These reports are handled as business confidential items. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each laboratory to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this report is to identify common asbestos laboratory performance problems and isolate the potential causes.

Internal Audits

Each laboratory will also conduct periodic internal audits of their specific operations. Details on these internal audits are provided in the laboratory QA Management Plan. The laboratory QAM will immediately contact the LC and the QATS contractor if any issues are identified during internal audits that may impact data quality.

B.5.3.4 Laboratory QC Analyses

The type of microscopy technique utilized to analyze samples for asbestos under this study is PLM. The most recent versions of all referenced analysis methods and SOPs are available in the Libby Lab eRoom.

The following sections summarize project-specific QA/QC requirements. The analytical methods should be consulted for detailed descriptions of method-required QA/QC measures.

B.5.3.4.1 Laboratory QC for PLM-VE and PLM-Grav

Laboratory QA/QC for PLM-Grav is ensured through compliance with laboratory-based QA/QC requirements for the NIOSH Method 9002, as specified by NVLAP. No additional project-specific QA/QC requirements have been established for PLM-Grav.

Laboratory-based QC requirements for PLM-VE are specified in SOP SRC-LIBBY-03 and Libby Laboratory Modification LB-000073. Three types of laboratory-based QC analyses will be performed for PLM-VE, including laboratory duplicates, inter-laboratory analyses, and PE standards. Detailed information on the Libby-specific requirements for each type of PLM-VE QC

analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in SOP SRC-LIBBY-03 and LB-000073.

It is the responsibility of the laboratory manager to ensure that the proper number of PLM-VE laboratory duplicate analyses is completed. Inter-laboratory analyses for PLM-VE will be selected *post hoc* by the QATS contractor (or their designee) in accordance with the selection procedures presented in LB-000073. The LC will provide the list of selected inter-laboratory analyses to the laboratory manager and will facilitate the exchange of samples between the analytical laboratories.

It is the responsibility of the SPF QAM to ensure that the appropriate number of PE standards is inserted. See Section B5.2.5 for more information on PE standards.

B.6 Instrument Maintenance and Calibration

B.6.1 Field Equipment

All field equipment (e.g., sampling shovels, GPS units) will be maintained in basic accordance with manufacturer specifications. Maintenance and calibration of equipment shall be done in accordance with EPA-LIBBY-2012-03 and/or CDM-LIBBY-09 as included in Appendix B. When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled "out of order" and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as "out of order" will notify the FTL overseeing the confirmation sampling activities. It is the responsibility of the FTL to facilitate repair of the out-of-order equipment. This may include having appropriately trained field team members complete the repair or shipping the malfunctioning equipment to the manufacturer. Field team members will have access to basic tools required to make field acceptable repairs. This will allow timely repair of "out of order" equipment.

B.6.2 Laboratory Instruments

All laboratory instruments used for this project will be maintained and calibrated in accordance with the manufacturer's instructions. Specifics regarding maintenance and calibration of equipment are detailed in 16-ASB-06.00, SRC-LIBBY-01, and SRC-LIBBY-03. If any deficiencies in instrument function are identified, all analyses shall be halted until the deficiency is corrected. The laboratory shall maintain a log that documents all routine maintenance and calibration activities, as well as significant repair events, including documentation that the deficiency has been corrected.

B.7 Inspection/Acceptance of Supplies and Consumables

B.7.1 Field

In advance of field activities, the FTL or designee will check the field equipment/supply inventory and procure additional equipment and supplies that are needed. The FTL or designee will also check that in-house measurement and test equipment used to collect data/samples as part of this QAPP is in good, working order, and procured equipment is acceptance tested prior to use (according to SOP EPA-LIBBY-2012-03, *Control and Measurement and Test Equipment*,

Appendix B). Items that the FTL or designee deems unacceptable will be removed from inventory and repaired or replaced as necessary. The inventory and procurement of equipment and supplies is discussed in detail in Section B.2.1.3.

B.7.2 Laboratory

The laboratory manager is responsible for ensuring that all reagents and disposable equipment used in this project is free of asbestos contamination. This is demonstrated by the collection of blank samples, as described in Section B.5.1.5.

B.8 Non-Direct Measurements

There are no non-direct measurements that are anticipated for use in this project.

B.9 Data Management

The following subsections describe the field, Troy SPF, and analytical laboratory data management procedures and requirements for this confirmation sampling effort. These subsections also describe the project databases utilized to manage and report data from this confirmation sampling effort. Detailed information regarding data management procedures and requirements can be found in the *EPA Data Management Plan for the Libby Asbestos Superfund Site* (EPA 2015).

B.9.1 Field Data Management

Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Data for the Site are captured in various Scribe projects. Additional information regarding Scribe and the Libby Scribe project databases is discussed in Section B.9.4. The Field Data Manager utilizes a “local” field Scribe project database (i.e., LibbyCDM_Field.mdb) to maintain field sample information. The term “local” denotes that the database resides on the server or personal computer of the entity that is responsible for the creating/managing the database. It is the responsibility of the Field Data Manager to ensure that all local field Scribe project databases are backed-up nightly to a local server.

Field sample information from the FSDS is manually entered by A&E sample coordination staff using a series of standardized data entry forms (i.e., DE Tool). This tool is a Microsoft Access database that was originally developed by ESAT. The DE Tool is currently maintained by the A&E and resides on the local server in the project office. This tool is used to prepare an electronic COC. Data in the DE Tool are imported into the local field Scribe project database by the Field Data Manager.

It is the responsibility of the Field Data Manager to “publish” sample and COC information from the local field Scribe database to Scribe.NET. It is not until a database has been published via Scribe.NET that it becomes available to external users.

B.9.2 Troy SPF Data Management

The Troy SPF utilizes a local SPF Scribe project database to maintain soil sample preparation information. Soil preparation information from the preparation log sheets is entered into the local SPF Scribe project database by SPF personnel. After the data entry is checked against the original forms, it is the responsibility of the SPF Manager (or their designee) to publish soil sample preparation information from the local SPF Scribe database to Scribe.NET.

B.9.3 Analytical Laboratory Data Management

The analytical laboratories utilize several standardized data reporting tools (Libby-specific EDD and LADT) developed specifically for the Libby project to ensure consistency between laboratories in the presentation and submittal of analytical data. Once the analytical laboratory has generated an EDD with results, the spreadsheet(s) are uploaded to a local FTP site maintained by the ESAT project data manager.

Additionally, EDDs may be transmitted to email recipients as specified by the ESAT LC.

The ESAT Project Data Manager utilizes a local analytical Scribe project database (i.e., LibbyLab2016.mdb) to maintain analytical results information by calendar year. The EDDs are uploaded directly into the analytical Scribe project database. It is the responsibility of the ESAT Project Data Manager to publish analytical results information from the local analytical Scribe database to Scribe.NET.

B.9.4 Libby Project Database

As noted above, Scribe is a software tool developed by ERT to assist in the process of managing environmental data. A Scribe project is a Microsoft Access database. Multiple Scribe projects can be stored and shared through Scribe.NET, which is a web-based portal that allows multiple data users controlled access to Scribe projects. Local Scribe projects are “published” to Scribe.NET by the entity responsible for managing the local Scribe project. External data users may “subscribe” to the published Scribe projects via Scribe.NET to access data. Subscription requests are managed by ERT.

All data collected for this confirmation sampling effort will be maintained in Scribe. As discussed above, data will be captured in various Scribe project databases, including a field Scribe project (i.e., LibbyCDM_Field.mdb) and an analytical results Scribe project (i.e., LibbyLab2016.mdb).

B.9.5 Data Reporting

Data users can access data for the Libby project through Scribe.NET. To access data, a data user must first download the Scribe application from the EPA ERT website[5]. The data user must then subscribe to each of the published Scribe projects for the Site using login and password information that are specific to each individual Scribe project. Scribe subscriptions for the Libby project are managed by ERT. Using the Scribe application, a data user may download a copy of any published Scribe project database to their local hard drive. It is the responsibility of the data user to regularly update their local copies of the Libby Scribe projects via Scribe.NET.

[5] http://www.ertsupport.org/scribe_home.htm

The Scribe application provides several standard queries that can be used to summarize and view results within an individual Scribe project. However, these standard Scribe queries cannot be used to summarize results across multiple Scribe projects (e.g., it is not possible to query both field and laboratory projects using these standard Scribe queries).

If data users wish to summarize results across multiple published Scribe projects, there are two potential options. Data users may request the development of a “combined” project from ERT. This combined project compiles tables from multiple published Scribe projects into a single Scribe project. This allows data users to utilize the standard Scribe queries to summarize and view results.

Alternatively, data users may download copies of multiple published Scribe project databases for the Site and utilize Microsoft Access to create user-defined queries to extract the desired data across Scribe projects. This requires that the data user is proficient in Microsoft Access and has an intimate knowledge of proper querying methods for asbestos data for the Site.

It is the responsibility of the data users to perform a review of results generated by data queries and standard reports to ensure that they are accurate, complete, and representative. If issues are identified by the data user, they will be reported to the EPA Region 8 Data Manager or their designate for resolution using SharePoint. It is the responsibility of the EPA Region 8 Data Manager to notify the appropriate entity (e.g., field, Troy SPF, analytical laboratory) in order to rectify the issue.

Section C: Reporting Process

C.1 Assessment and Response Actions

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities.

C.1.1 Assessments

Performance assessments are quantitative checks on the quality of a measurement system and are appropriate to analytical work.

System assessments are qualitative reviews of different aspects of project work to check the use of appropriate QC measures and the general function of the QA system. Field system assessments will be performed under the direction of EPA RPM or designate, with support from the ECs PM or designate. Field surveillances will be conducted at the onset of field sampling activities and if field processes are revised or other QA/QC procedures indicate potential deficiencies. It is not anticipated that a field audit will be conducted for this sampling effort.

Laboratory system assessments/audits will be coordinated by the EPA. Performance assessments for the laboratories may be accomplished by submitting blind reference material (i.e., performance evaluation samples). These assessment samples are samples with known concentrations that are submitted to the laboratories without identifying them as such to the laboratories. Performance assessments will be coordinated by the EPA.

C.1.2 Response Actions

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or EPA LC). For deficiencies or quality problems that are not resolved with rapid corrective action, the individual identifying the quality problem will initiate a corrective action request (CAR) and will forward the form to the EC's PM and QAM, who will be jointly responsible for investigating the problem and following up on the resolution of the problem. The CAR and documentation of the resolution will be provided to the EPA RPM, BNSF, and the EC's project manager. EPA project management will be notified when quality problems arise that cannot be corrected quickly through routine procedures.

In addition, when modifications to this QAPP are required, either for field or laboratory activities, a ROM must be completed by field staff, reviewed by BNSF, the EC Project Manager, and approved by the EPA prior to implementation.

C.2 Reports to Management

Weekly progress reports will be emailed to BNSF for review, prior to submission to the EPA RPM for further distribution. Additionally, QA reports will be provided to EPA management for

routine audits and whenever quality problems are encountered. Field staff will note any quality problems on FSDSs or in field logbooks. Further, the field and laboratory managers will inform the EPA RPM, BNSF, and the EC Project Manager upon encountering quality issues that cannot be immediately corrected.

Section D: Data Quality Assurance Process

D.1 Data Review, Verification and Validation

D.1.1 Data Review

Data review of project data typically occurs at the time of data reporting by the data users and includes cross-checking that sample IDs and sample dates have been reported correctly and reported values are as expected. The criteria used to determine if data is useable, unusable, or requires the assignment of qualifiers is found in the SOPs listed below in Sections D.2.1 and D.2.2 and included in Appendix B. If issues or discrepancies are found in asbestos data, the data reviewer will contact the EPA Region 8 Data Manager (Jeffrey Mosal), who will then notify the appropriate party in order to correct the issue.

D.2 Verification and Validation Methods

D.2.1 Data Verification

Data verification includes checking that results have been transferred correctly from the original hand-written, hard copy field and analytical laboratory documentation to the project database. The goal of data verification is to identify and correct data reporting errors.

For analytical laboratories that utilize the Libby-specific EDD spreadsheets for asbestos data reporting, data checking of reported analytical results begins with automatic QC checks that have been built into the spreadsheets. In addition to these automated checks, a detailed manual data verification effort will be performed for 10% of all non-investigative Libby samples (i.e., samples that are not directly used in the risk assessment to make risk assessment decisions). Data verification will be completed in accordance with EPA-Libby-10 (Revision 0) *Standard Operating Procedure for PLM Data Review and Data Entry Verification* to ensure analytical results and field sample information in the project database is accurate and reliable.

The data verification review ensures that data reporting issues are identified and rectified to limit the impact on overall data quality. If issues are identified during the data verification, the frequency of these checks may be increased as appropriate.

Data verification will be performed by A&E staff familiar with project-specific data reporting, analytical methods, and confirmation sampling requirements. The data verifier will prepare a data verification report (template reports are included in the SOPs) to summarize any issues identified and necessary corrections. A copy of this report will be provided to the appropriate project Data Manager, LC, EPA RPM, and BNSF. It is the responsibility of the project database manager to coordinate with the FTL and/or LC to resolve any project database corrections and address any recommended field or laboratory procedural changes from the data verifier. The database manager is also responsible for electronically tracking in the project database which data have been verified, who performed the verification, and when.

D.2.2 Data Validation

Unlike data verification, where the goal is to identify and correct data reporting errors, the goal of data validation is to evaluate overall data quality and to assign data qualifiers, as appropriate, to alert data users to any potential data quality issues. Data for asbestos in soil will be validated by the EC QAM in accordance with the applicable method, investigation-specific Analytical Requirements Summaries, laboratory ROMs, and Libby-specific data validation SOPs developed by CB&I, which include SOP QATS-70-094 (*Validation of PLM Data Deliverables*) and SOP QATS-70-096 (*Validation of PCM Data Deliverables*). Validation of PLM data will be documented on Form QATS 70-094F001R01 (Data Review Checklist for the Validation of Libby Polarized Light Microscopy [PLM] Data Deliverables, while the validation of PCM data will be on Form QATS-70-096F001R02 (Data Review Checklist for the Validation of Libby Phase Contrast Microscopy Data Deliverables) (Appendix B).

Criteria that will be evaluated include sample receipt, sample preparation, microscope alignment, instrument calibrations, stopping rules, structure recording and identification, blank analysis (if applicable), recount/repreparation analysis (if applicable), and overall assessment of data. A total of 5% of sample results are selected annually by CB&I for validation by randomly choosing sample results to be representative of each laboratory, analytical method, and media type. A comprehensive data validation effort will be completed annually by the QATS contractor and results will be reported in a yearly data validation report. This report shall detail the validation procedures performed and provide a narrative on the quality assessment for all analytical methods, including a summary of any data qualifiers that are to be added to the project database to denote when results do not meet project-specific acceptance criteria, and shall detail any deficiencies and required corrective actions stemming from the data validation review. Results of the data validation will be summarized in a Data Summary Report, which will summarize the results of this confirmation soil sampling effort. This addendum will also include recommendations for Site QA/QC program changes to address any data quality issues.

For OU6 data reviews, the EC QAM will provide a summary of the records that have been validated (AnalysisID and SampNo), the date they were validated, any recommended data qualifiers, and their associated reason codes to the ESAT Region 8 Data Manager. It is the responsibility of the EPA Region 8 Data Manager to ensure that the appropriate data qualifiers and reason codes recommended by the data validator are added to the project database, and to electronically track in the project database which data have been validated, who performed the validation, and when.

D.3 Reconciliation with User Requirements

Once all samples from a specific property have been collected and analytical data has been generated, data will be reviewed to evaluate whether confirmation sampling objectives were achieved. This is typically performed by the EC's FTL (or other designated confirmation sampling staff) whose responsibility it is ensure reported confirmation sampling results are adequate and appropriate for their intended use. To the extent possible, this data usability assessment will utilize results of any data verification and data validation efforts to provide information on overall data quality specific to each confirmation sampling effort.

The data usability assessment will evaluate results with regard to several data usability indicators, including precision, accuracy/ bias, representativeness, comparability, completeness, and whether specified analytic requirements (e.g., sensitivity) were achieved. Table D-1 provides detailed information for how each of these indicators may be evaluated for the reported asbestos data. The data usability assessment results and conclusions will be included in any investigation-specific data summary reports.

Non-attainment of project requirements may result in additional sample collection or field observations in order to achieve project needs.

Table D-1: General Evaluation Methods for Assessing Asbestos Data Usability

Data Usability Indicator	General Evaluation Method
Precision	Sampling – Review results for co-located samples, field and preparation duplicates to provide information on variability arising from medium spatial heterogeneity and sampling and analysis methods. Analysis – Review results for PLM laboratory duplicates to provide information on variability arising from analysis methods. Review results for inter-laboratory analyses to provide information on variability and potential bias between laboratories.
Accuracy/Bias	PLM – Review results for LA-specific performance evaluation standards to provide information on direction/magnitude of potential bias. Review results for blanks to provide information on potential contamination.
Representativeness	Review relevant audit report findings and any ROMs for potential data quality issues.
Comparability	Compare the sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Determine the percent of samples that were able to be successfully collected and analyzed (e.g., 99 of 100 samples, 99%).
Sensitivity	*Not applicable to PLM analysis.*

Notes:
SOP =- standard operating procedure.
ROM = record of modification.

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CB&I
BNSF
USACE
TechLaw
TechLaw Subcontractor
KJC
CDM Smith
Lines of authority
Lines of communication

Kennedy/Jenks Consultants
BNSF Railway Company
Libby, Montana

Organizational Chart for OU6 BNSF Rail Corridor Surface Soil Sampling 2016

1649206.10
August 2016
Figure 1

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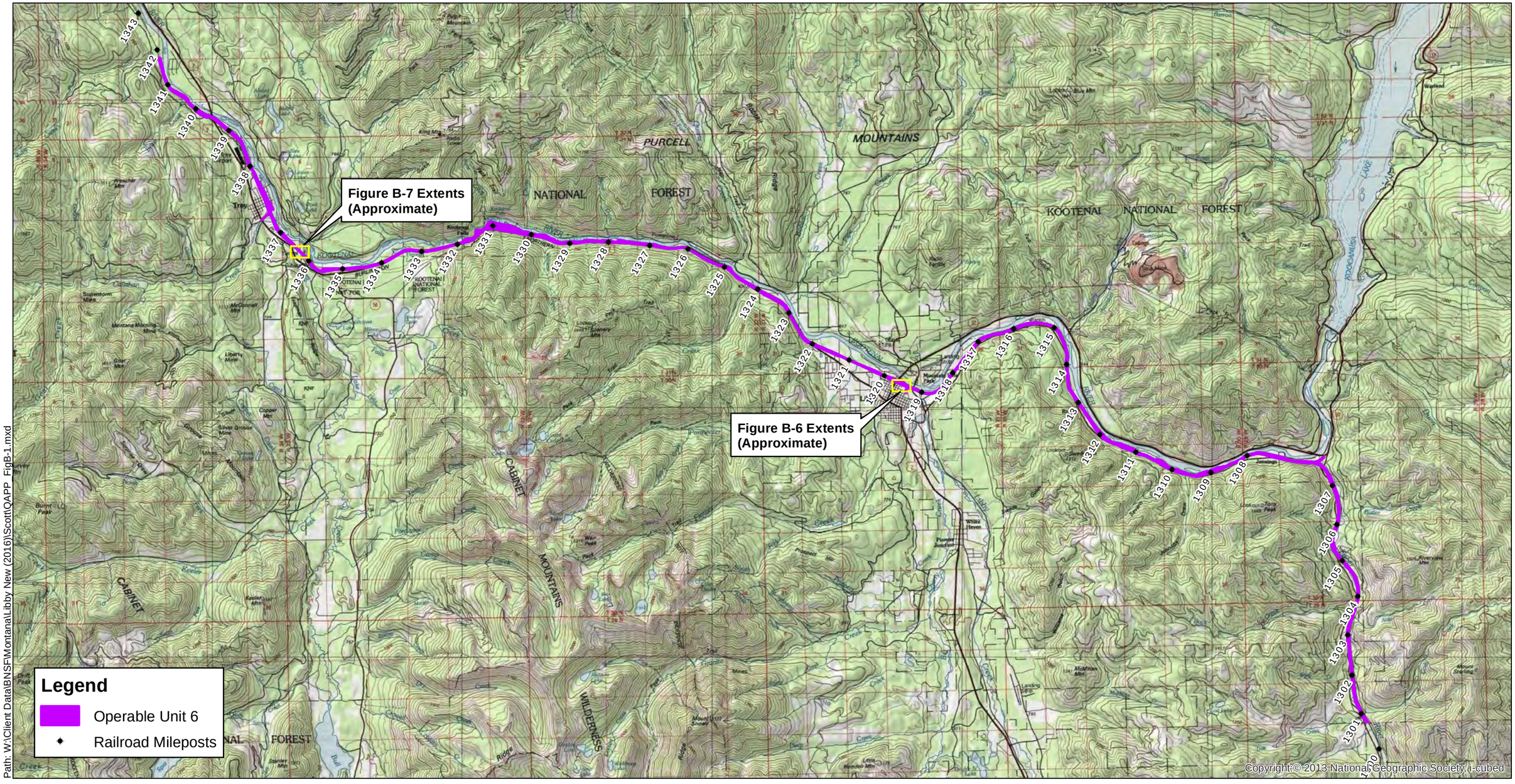


Notes:
1) Operable Unit (OU) extents and investigation area data provided by CDM.
2) Limits of OU6 extend from approximately MP 1300.7 to MP 1341.8.
3) Milepost, railyard, and rail siding data provided by BNSF.
4) Railroad mileposts are not equally spaced at 5,280 foot intervals.

N

0 1 2 4 Miles

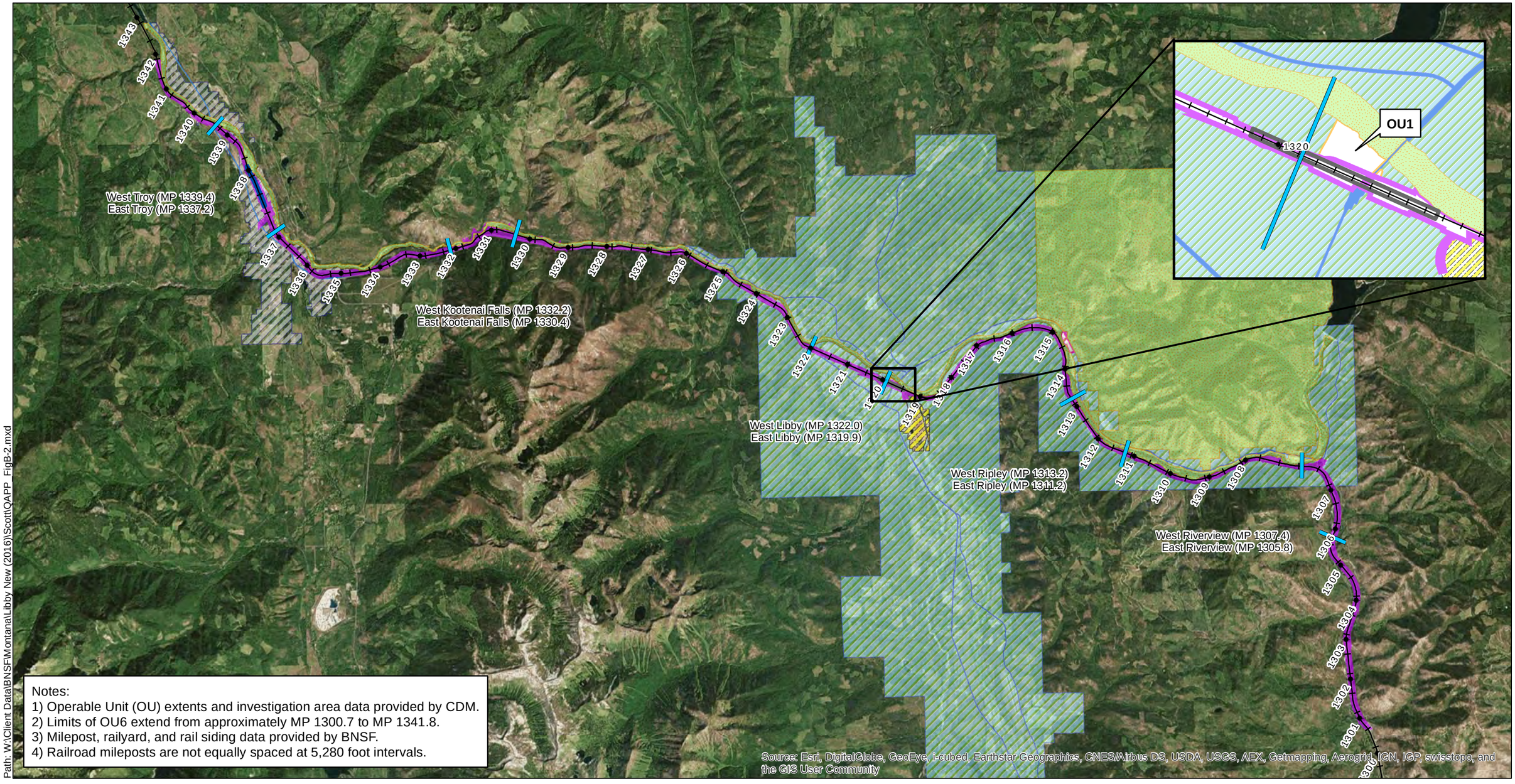
Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Site Location Map

1649206.10
August 2016

Figure B-1



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Notes:
1) Operable Unit (OU) extents and investigation area data provided by CDM.
2) Limits of OU6 extend from approximately MP 1300.7 to MP 1341.8.
3) Milepost, railyard, and rail siding data provided by BNSF.
4) Railroad mileposts are not equally spaced at 5,280 foot intervals.

Legend

- Railroad Mileposts
- Siding Extent
- Railway
- Libby Yard
- Troy Yard

Site OU Boudnaries

- OU1: Former Export Plant
- OU2: Former Screening Plant
- OU3: (Study Area) Mine and Kootenai River
- OU4: Libby Homes and Businesses
- OU5: Former Stimson Lumber
- OU6: BNSF Rail Line
- OU7: The Town of Troy
- OU8: Roadway

N

0 1 2 4 Miles

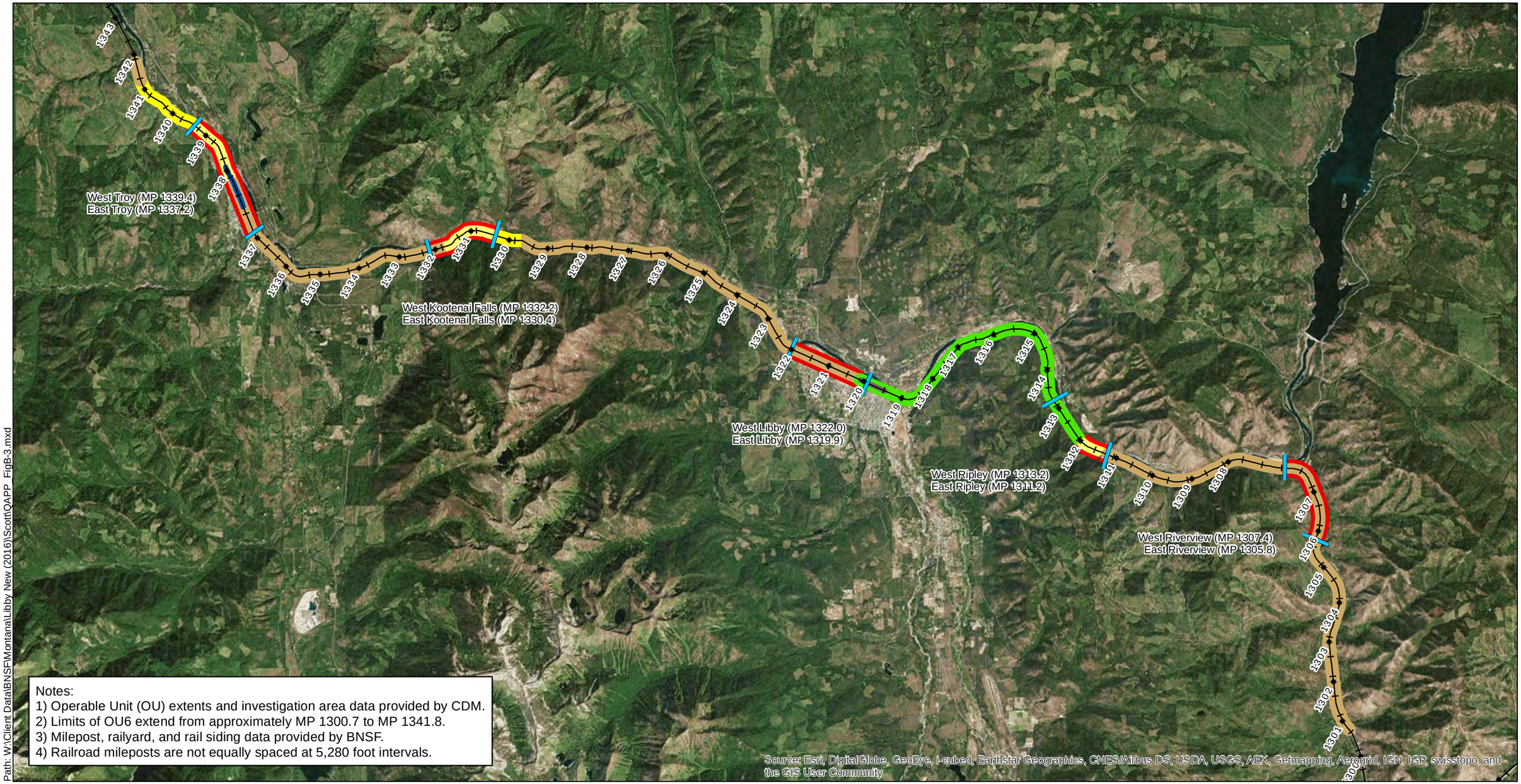
Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Operable Unit Map

1649206.10
August 2016

Figure B-2



Notes:
1) Operable Unit (OU) extents and investigation area data provided by CDM.
2) Limits of OU6 extend from approximately MP 1300.7 to MP 1341.8.
3) Milepost, railyard, and rail siding data provided by BNSF.
4) Railroad mileposts are not equally spaced at 5,280 foot intervals.

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Legend

- Railroad Mileposts
- Siding Extent
- Railway
- Libby Yard
- Troy Yard
- Agency Identified Investigation Complete
- Agency Identified Partial Investigation Complete - ABS
- Agency Identified Investigation Needed
- Agency Identified Investigation Needed - Rail Siding
- Agency Identified Partial Investigation Complete - ABS, Rail Siding

N

0 1 2 4 Miles

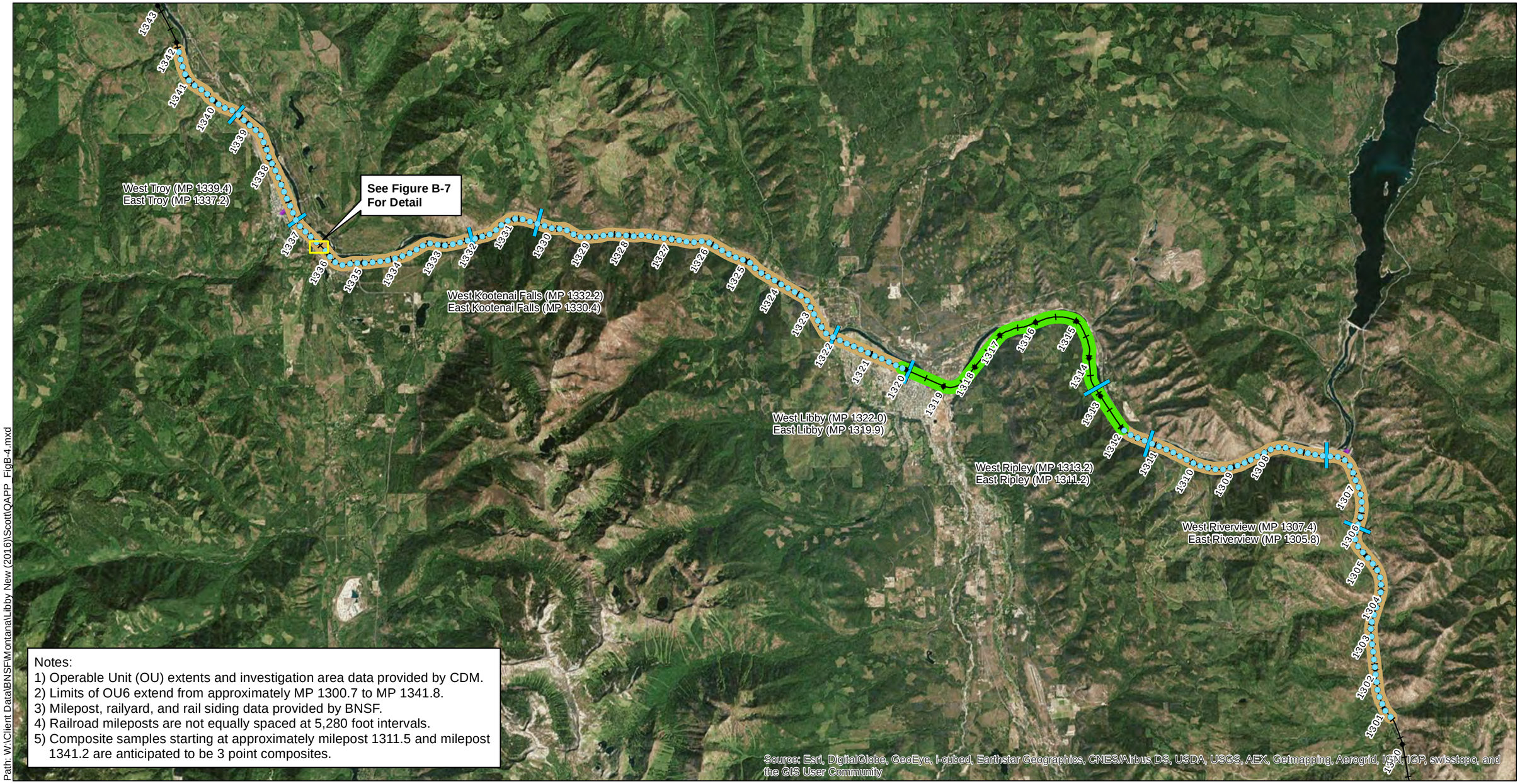
Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Railway and Rail Siding Status Map

1649206.10
August 2016

Figure B-3



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Legend

- Composite Surface Soil Sample
- Railroad Mileposts
- Siding Extent
- Railway
- Agency Identified Investigation Complete
- Agency Identified Investigation Needed

N

0 1 2 4 Miles

Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Right-of-Way - Surface Soil Composite Sample Locations

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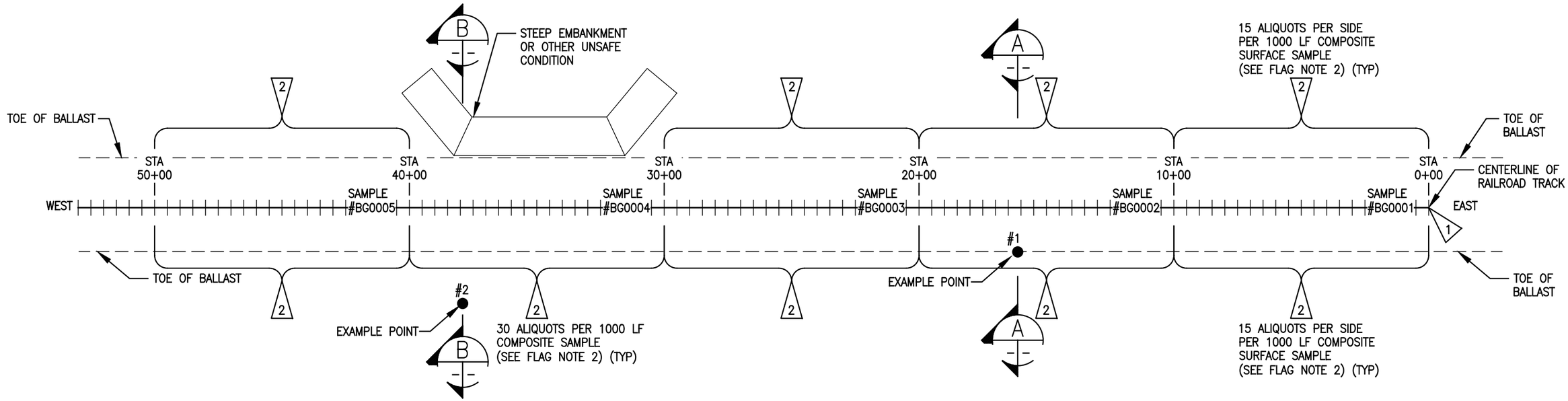
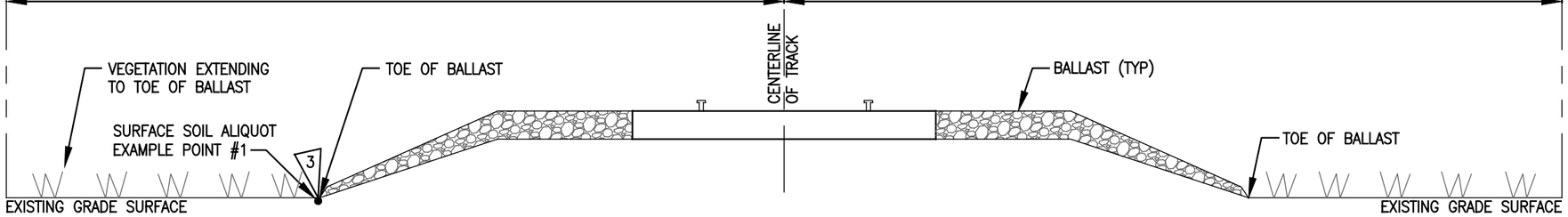
Figure B-4



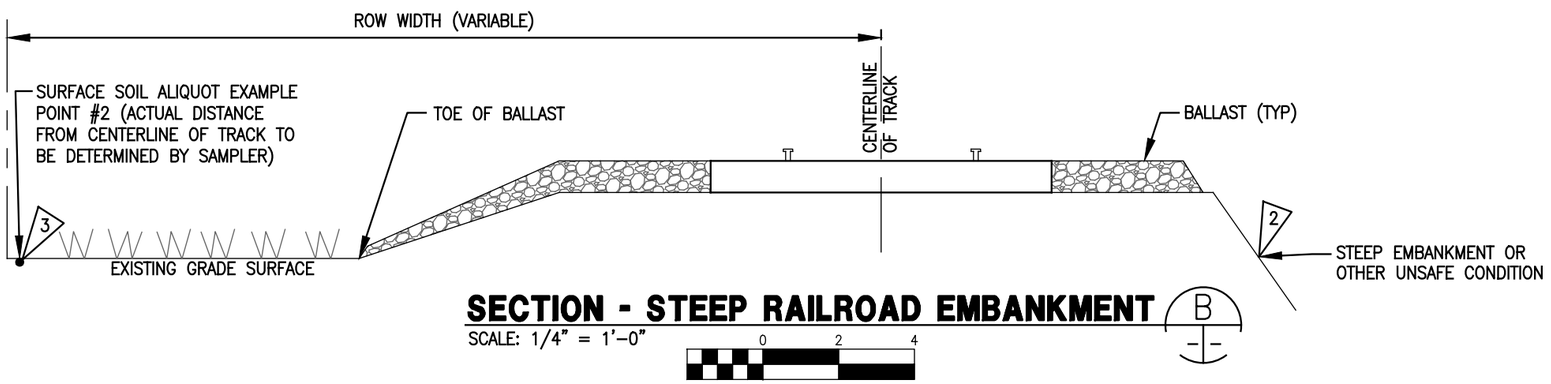
CONCEPTUAL 1000 LF COMPOSITE SAMPLE COLLECTION LAYOUT

SCALE: NONE



SECTION - TYPICAL RAILROAD EMBANKMENT

SCALE: 1/4" = 1'-0"



SECTION - STEEP RAILROAD EMBANKMENT

SCALE: 1/4" = 1'-0"

NOTES:

1. COLLECT 30-POINT COMPOSITE SURFACE SAMPLES FROM 0 TO 6 INCHES BELOW GROUND SURFACE EVERY 1000 LINEAR FEET (LT; APPROXIMATE). ALL SAMPLES WILL BE COLLECTED WITHIN BNSF RIGHT-OF-WAY, (ROW).
2. THE 30 ALIQUOTS PER 1000 LF COMPOSITE SAMPLE WILL BE SPLIT EVENLY ON EACH SIDE OF THE TRACK (15 ALIQUOTS PER SIDE), UNLESS SAFE CONDITIONS DO NOT EXIST ON A GIVEN SIDE OF THE TRACK. THE SPACING OF ALIQUOTS COLLECTED ON A GIVEN SIDE OF TRACK WILL BE CONSISTENT WITH RESPECT TO TRACK ALIGNMENT TO ALLOW FOR A RELATIVELY UNIFORM DISTRIBUTION LONGITUDINALLY. ALIQUOTS WILL BE COLLECTED BETWEEN EDGE OF BALLAST AND EDGE OF BNSF RIGHT-OF-WAY.
3. COMPLETE PROCEDURE FOR SAMPLE COLLECTION, COMPOSITE PREPARATION, AND HANDLING PROVIDED IN QAPP, APPENDIX B.
4. IF VISIBLE VERMICULITE (VV) IS OBSERVED, REVIEW AND FOLLOW SAMPLE HANDLING AND COLLECTION PROCEDURES DEFINED IN APPENDIX B.

Kennedy/Jenks Consultants

BNSF RAILWAY COMPANY
LIBBY, MONTANA

EXAMPLE RIGHT-OF-WAY CONFIRMATION SURFACE SOIL COMPOSITE SAMPLING APPROCH AND CONSIDERATIONS

(FWY) 1649206\FIG-B-05

8\16

FIGURE B-5

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Legend

- Approximate Track Centerline
- OU6 - BNSF Property
- Common Use Area
- Specific/Limited Use Area

N

0 25 50 100 Feet

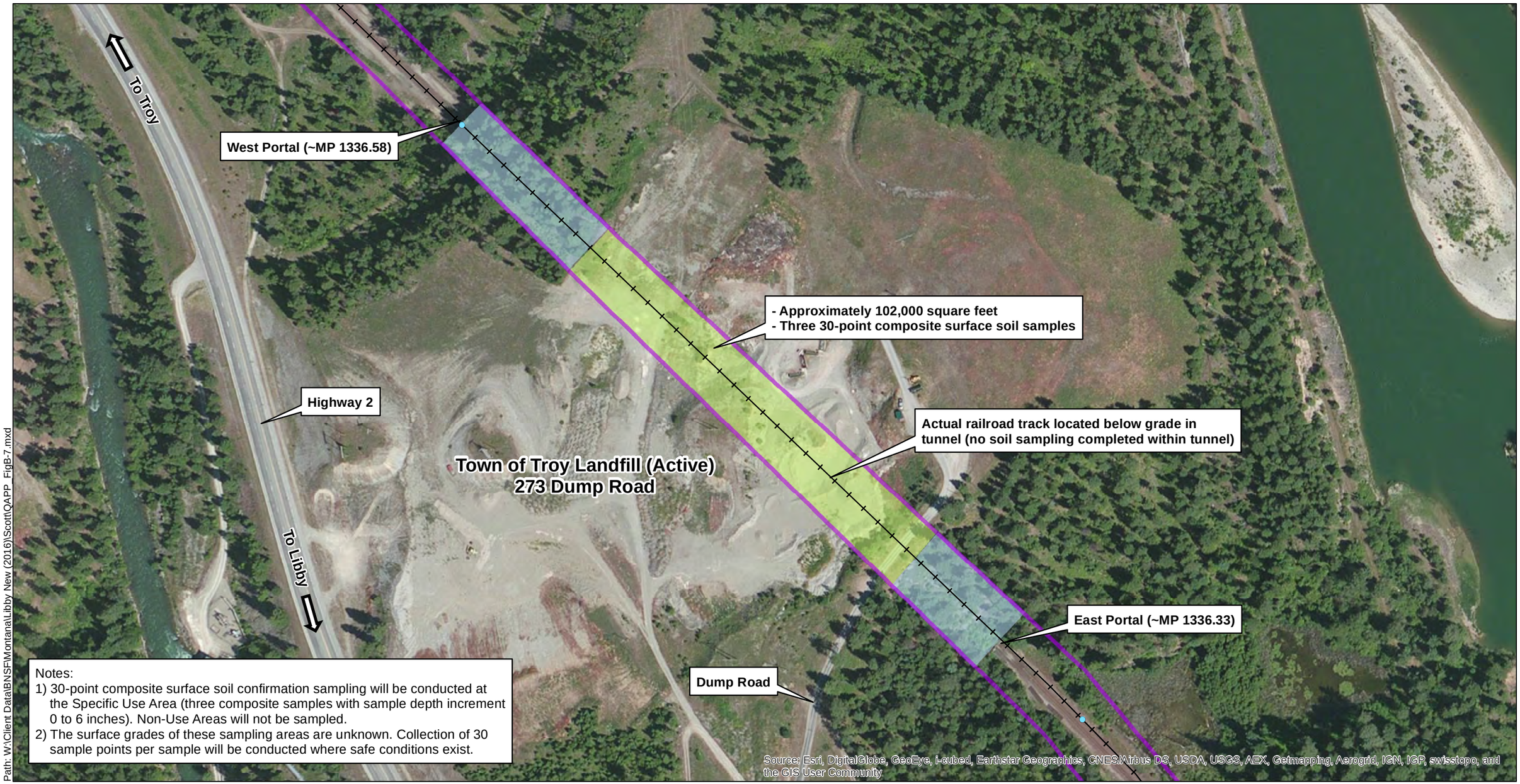
Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Amtrak Depot - Confirmation Surface Soil Composite Sample Locations

1649206.10
August 2016

Figure B-6



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Legend

- Approximate Track Centerline
- Non-Use Area (Forested)
- Specific Use Area (Active Town of Troy Landfill)
- ROW Composite Surface Soil Sample
- OU6 - BNSF Property

N

0 90 180 360 Feet

Kennedy/Jenks Consultants

BNSF Railway Company
BNSF Operable Unit 6
Libby, Montana

Surface Grade Above Troy Tunnel - Confirmation Surface Soil Composite Sampling Locations and Land Use Designations

1649206.10
August 2016

Figure B-7

Appendix A

Detailed Data Quality Objectives

APPENDIX A

Detailed Data Quality Objectives

The DQO process, based on scientific methods, is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The DQOs presented in this section were developed in accordance with EPA guidance (EPA 2006).

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps include:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify tolerable limits on decision errors
7. Optimize the design

A.1 Step 1 – State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will be unambiguous.

Portions of OU6 between milepost (MP) 1312 and 1320 have been classified as “investigation complete” by the EPA (as shown on Figure B-3 of the QAPP) as completed corrective actions and surface and subsurface soil data collected to date has been determined as sufficient to reduce uncertainties about LA concentrations in soil. However, localized surface soil sampling efforts have partially characterized portions of OU6 outside MP 1312 to MP 1320 and results indicate LA concentrations ranging from Bin A (non-detect) to Bin B2 (<1%) by polarized light microscopy using visual area estimation (PLM-VE). Reported concentrations are less than the Transportation Corridor remedial action level (RAL) (see Section A5.3). These partially characterized portions of OU6 are referenced in the *Protectiveness Evaluation for Potential Risk Management Approaches Libby Asbestos Superfund Site – Operable Units 4, 5, 6, 7, and 8* (CDM Smith 2015, Section 8.2.3, page 31) as having, “some uncertainties regarding whether RALs could be exceeded in locations where soil samples have not been collected.”

EPA has requested confirmatory surface soil sampling be conducted within the BNSF right-of-way (ROW) between MP 1301 to MP 1312, MP 1320 to 1336.33, and MP 1336.58 to MP 1342 where surface soil sampling has not been completed at regular intervals. Sampling will not be completed within the Troy Tunnel (approximately MP 1336.33 to MP 1336.58) due to the lack of exposed soil within the tunnel. Specifically, the EPA and their consultant CDM Smith identified and categorized the extent of the mainline track and rail sidings where surface soil sampling has

been requested, as reproduced on Figure B-3[1]. This sampling effort will herein be referred to as ROW Confirmation Surface Soil Sampling.

Additionally, the EPA has requested confirmatory surface soil sampling at two properties located within the ROW that are not actively operated by BNSF. These properties consist of the following:

- The ground surface (BNSF-owned land) above the Troy Tunnel ROW which bisects land owned by the City of Troy. The City of Troy has reportedly included the BNSF ROW as part of a waste transfer station.

- BNSF-owned land south of the Libby Amtrak Depot used for parking, driveways and green space.

Sampling conducted at these two specific locations will herein be referred to as Non-Operating Property Confirmation Surface Soil Sampling.

Physical cleanup of LA contaminated soils has been completed by BNSF, within OU6, and specifically within the BNSF Libby Railyard. Subsequent ABS investigations and soil confirmatory sampling have been conducted in OU6, which support the conclusion that these removal actions were effective in mitigating LA exposures, and no further physical cleanups are likely necessary in OU6 (CDM 2015, Section 8.2.3). Both ROW and Non-Operating Property Confirmatory surface soil sampling efforts (discussed in Section B) will serve to determine if surface soils with LA concentrations greater than the Transportation Corridor RAL (concentrations $\geq$ 1 percent LA) are present in OU6. If LA concentrations in surface soils are less than the Transportation Corridor RAL, then remedial actions are likely to be limited to institutional controls (ICs).

Therefore, the reason for this project is to determine whether LA concentrations in surface soils within OU6 exceed the Transportation Corridor RAL.

The two primary objectives of this confirmatory sampling effort are to:

1. Determine whether LA concentrations in soil on BNSF-owned property within OU6 exceed the Transportation Corridor RAL.

2. Compare surface soil data, collected as part of this confirmatory sampling effort, to the Transportation Corridor RAL, to determine if remedial actions consisting of institutional controls will be sufficiently protective of receptors in OU6 or whether physical cleanup actions will be required.

Portions of OU6 to be sampled during this confirmation sampling effort (MP 1301 to MP 1312 and MP 1320 to 1336.33 and MP 1336.58 to MP 1342), are herein referred to as the ROW Confirmation Sampling Area. BNSF-owned land abutting the Libby Amtrak Depot and BNSF-owned land above the Troy Tunnel are herein referred to as the Non-Operating Property Confirmation Sampling Area.

A.2 Step 2 – Identify the Decision

This step identifies what questions the investigation will attempt to resolve and what actions may result. The principal study questions and possible alternative actions are as follows:

[1] The start and end railroad MPs shown on the CDM Smith figure was corrected by Kennedy/Jenks Consultants.

Table A-1 Decision Statements

Response Item Evaluated	Principal Study Question	Alternative Actions
Evaluate level and extent of LA present in surface soils	Is LA detected at levels greater than the TC RAL in any soil sample collected in OU6?	• Document location and extent of LA- contaminated soil for removal action • Take no action

Notes:

LA = Libby Amphibole asbestos
TC RAL = Transportation Corridor Remedial Action Level (LA soil concentrations of Bin C by PLM-VE, LA is present at levels greater than or equal to 1 percent).

A.3 Step 3 – Identify the Inputs to the Decision

The purpose of this step is to identify the information and measurements that need to be obtained to resolve the decision statements. The information needed to resolve the principal study questions are summarized in Table A-2.

Table A-2: Summary of Inputs to Resolve Study Questions and Use of Information Acquired from Inputs

Principal Study Question	Input to Resolve Question	Use of Input to Resolve Question
Is LA detected at levels greater than the TC RAL in any soil sample collected in OU6?	Collection and Analysis of Composite Soil Samples	Approximately one hundred ninety one 30-point composite soil samples will be collected from ROW and Non-Operating Property Sampling Areas. The composite soil samples will be analyzed using PLM-VE and PLM-Grav methods, as applicable. The laboratory analytical results will be compared to the TC RAL to determine if physical cleanup actions will be required.

Notes:

PLM – VE = Polarized Light Microscopy – Visual Estimation
PLM – Grav = Polarized Light Microscopy – Gravimetric

A.4 Step 4 – Define the Boundaries of the Study

This step specifies the spatial and temporal boundaries of this investigation.

A.4.1 Spatial Bounds

The information gathered to answer the objectives will be collected from areas along the ROW and Non-operating Property Confirmation Sampling Areas as shown on Figures B-4, B-6 and B-7.

As per the ROD (EPA 2016), the term “surface soil” is used to describe soil that would be encountered by human receptors under “typical” activities. “Typical” activities conducted by BNSF along the ROW (grading, ditching, track maintenance) are not likely to disturb soils to a depth greater than six inches below grade. Therefore, surface soil samples from the ROW Confirmation Sampling Area will be collected at depths between 0 inches and 6 inches below ground surface (bgs). Surface soil samples collected from Non-Operating Property Confirmation Sampling Area will also be collected from the depths between 0 inches and 6 inches bgs. All confirmation surface soil samples will be collected within BNSF property boundaries.

A.4.2 Temporal Bounds

It is not thought that asbestos concentrations in surface soil are likely to be time-variable in its current environment. Thus the time of field sampling effort is primarily dependent upon ease of site access and sample collection (i.e., easier to collect surface soil samples in the summer than in the winter).

A.5 Step 5 – Develop Decision Rules

The purpose of this step is to describe the method that the EPA will use to assess whether the data collected indicate acceptance and the resulting decision applied when acceptance is not obtained. The principal study question, inputs to resolve study questions, action levels, and decision rules are summarized in Table A-3.

Table A-3: Decision Rules

Principal Study Question	Input to Resolve Question	Input Requirements	Action Level	Decision Rule
Is LA detected at levels greater than the RAL in any soil sample collected in OU6?	Collection and Analysis of Composite Soil Samples	Analysis: PLM-VE and PLM-Grav with project-specific modifications Reported Result: % LA AS: 0.2%	> TC RAL	If levels of LA > TC RAL are detected in surface soil samples, area will be delineated for removal of contamination. If < TC RAL is detected, take no action.

Notes:

AS = Analytical Sensitivity

A.6 Step 6 – Specify Tolerable Limits on Decision Errors

The tolerable limits on decision errors, used to establish performance goals for the data collection design, are specified in this step.

Specific to performing this sampling investigation, two types of decision errors are possible:

A Type I (false negative) decision error would occur if a risk manager decides that a sample does not contain LA above a level of concern, when in fact it is of concern.

A Type II (false positive) decision error would occur if a risk manager decides that a sample does contain levels of LA above a level of concern, when in fact it does not.

The EPA is most concerned about guarding against the occurrence of Type I errors, since an error of this type may leave humans exposed to unacceptable levels of LA.

The EPA is also concerned with the probability of making Type II decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. Generally, the EPA allows for a 20 percent false positive rate.

For the purposes of completing all seven steps of the DQO process, the null hypotheses and consequences of making an incorrect decision are summarized in Table A-4. However, the gray region and tolerable limits on decision errors are not proposed because they are not applicable in this case.

Table A-4: Limits on Decision Errors

Principal Study Question	Null Hypothesis	Type I Error Will Result in:	Type II Error Will Result in:
Is LA detected at levels greater than the RAL in any soil sample collected in OU6?	Surface soils are contaminated with LA at levels >TC RAL	Determining that surface soils are not contaminated with LA at levels > TC RAL when they actually are. This may result in no subsequent exterior removal and in turn, an increased risk to human health.	Determining that surface soils are contaminated with LA at levels > TC RAL when they actually are not. This would result in unnecessarily including exterior excavation in the removal action and adds unnecessary costs to the removal.

Typically, Step 6 of the DQO process is useful to encourage careful design of decision rules by defining and integrating the errors that are acceptable based upon a myriad of integrated project management decisions such as reduction in risk to human health, implementability/practicability, and cost. As stated in the guidance document for development of DQOs: QA/G-4 (EPA 2006), solely statistically generated tolerable limits on decision errors are not necessary in certain cases provided that a line of reasoning (scientific justification) is presented that adequately defines acceptable limits or decision errors. This particular effort was put forth in the *Record of Decision for Libby Asbestos Superfund Site – Operable Units 4 through 8* (EPA 2016) for DQOs for the following surface soil sampling.

A.7 Step 7 – Optimize the Design for Obtaining Data

This step identifies a resource-effective data collection design for generating data that are expected to satisfy the DQOs. The data collection design is described in detail in the remaining sections of this QAPP and other site documents referenced in Section B.

Referencing the *Record of Decision for Libby Asbestos Superfund Site – Operable Units 4 through 8* (EPA 2016) and data previously generated for the Site, the DQOs have been designed to support the proposed activities and represent the best possible project planning effort. However, in implementing the requirements contained in this QAPP, unforeseen situations may arise or team members may find more efficient means to carry out some of the day-to-day activities. Therefore, team members are always afforded the opportunity to recommend optimization of the data gathering design. Recommendations must come through proper channels [i.e., through the Field Team Leader (FTL)] and documented using either a Record of Modification[2] to Documents Governing Field Activities form or an addendum to this QAPP. All modifications or addendums must be approved prior to making the proposed changes.

[2] The current version of the field ROM form is provided in the OU6 eRoom; current versions of the Troy SPF and laboratory ROM forms are provided in the Libby Lab eRoom.

Appendix B

Libby-Specific Standard Operating Procedures

BNSF and Kennedy/Jenks Consultants hereby adopt the following approved SOPs to the extent they apply to OU6

Libby Asbestos Superfund Site
Standard Operating Procedure
Field Logbook Content and Control

Prepared by: _____ Date: 7/23/12
CDM Smith

Approved by: _____ Date: 7/23/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--
1	7/23/12	To maintain consistency with requirements for completing other field documentation (e.g., field sample data sheets), eliminated the requirement to strike through, initial, and date any self-adhesive labels placed in the logbook.

1.0 Objective

Logbooks are an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the content and control of Libby Site field logbooks. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Ruler or similar scale – Used with a property-specific drawing or plan to measure distance and sizes of objects, buildings, and zones.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

2.2 Discussion

Field logbooks are an accounting of observations and/or activities occurring at or associated with the Libby Site. Field logbooks are also used to duly document changes to or deviations from governing documents referencing this SOP. Information recorded in field logbooks includes date/time, site personnel, observations, calculations, weather, locations of field activities, and a description of the field activity, methods, instruments, and results. Additionally, the logbook may contain descriptions of waste, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for documenting activities in field logbooks will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of data entries are in accordance with this procedure. It is also the responsibility of the TL to communicate the need for any changes to/deviations from the SOP with the appropriate personnel, and document the change/deviation using a Libby Field Record of Modification Form.

Field Team Members – Field team members who make entries in field logbooks are required to read this procedure before engaging in this activity. Field team members will be assigned a field logbook prior to field activities and will be responsible for the care and maintenance of the logbook. Field team members will return field logbooks to the project file at the end of the assignment.

4.0 Equipment

The following is required for the proper completion of field logbooks:

- Logbook
- Indelible black or blue ink pen
- Ruler or similar scale

5.0 Procedures

5.1 Preparation

Commercially available, bound field logbooks with waterproof paper and lined, consecutively numbered pages will be used. Separate field logbooks will be kept for each field activity and the cover (some items may be recorded on the inside cover) of each field logbook shall clearly indicate:

- Field logbook sequence number
- Start date and end date of entries
- Title of document governing field activities
- Activity (if the logbook is to be activity-specific), site name, and location
- Contact name and phone number (typically the Project Manager)

For ongoing field activities that may span months or years, designated staff (e.g., field administrative staff) shall manage the field logbooks by tracking to whom and the date each field logbook was assigned, the general activities recorded in each field logbook, and the date the field logbook was returned to the project file.

The first two pages of the logbook will be reserved for a table of contents (TOC), and the third page will be reserved for abbreviations, acronyms, and definitions.

5.2 Operation

The following general requirements will apply when completing logbook entries for the Libby Site:

- Record equipment calibrations, work, observations, and quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are required by the governing document referencing this SOP, the information collected on the form does not need to be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.
- Correct erroneous information recorded in a field logbook with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not remove any pages from the logbook.
- Document relinquishment of the logbook from one author to another (both parties must sign and date the transfer).
- Sign and date the final entry each day.
- When columns are used to organize information recorded on laboratory documents, the information recorded in the columns shall be identified in a column heading.

Entries into the field logbook shall be preceded with the time (written in military units) of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In these cases, the logbook must reference the automatic data record or form.

At each location where a sample is collected or an observation or measurement made, a detailed description of the location is required and a sketch of the location may be warranted. All maps or sketches made in the logbook should have descriptions of the features shown and a direction indicator. It is preferred that maps and sketches be oriented so that north is toward the top of the page. Any maps, sketches, figures, or data that will not fit on a logbook page, or any separate forms or drawings (e.g., FSDS sheets, drawing markups) required by the governing document referencing this SOP should be referenced in the logbook.

Other events and observations that should be recorded include:

- Changes in weather or site conditions that impact field activities or have the potential to impact data collection (e.g., rain impacting air samples, upwind disturbances)
- Deviations from procedures outlined in any governing documents referencing this SOP, including the rationale and authorization for the deviation as appropriate
- Problems, downtime, or delays
- Visitors to the site

5.3 Post-operation

To guard against loss of data as a result of damage or disappearance of logbooks, completed pages and any supporting attachments shall be periodically photocopied (weekly, at a minimum) and maintained in the project file.

At the conclusion of each field activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated, that corrections were made properly, and that the cover information and TOC are complete. As field logbooks are completed, electronic copies may need to be posted to a project eRoom – refer to the governing document referencing this SOP for requirements. All original logbooks will be catalogued and maintained in the project file.

6.0 Restrictions/Limitations

Field logbooks constitute the official record of onsite technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by governing agency personnel and their subcontractors. They are documents that may be used in court to indicate dates, personnel, procedures, and techniques employed during site activities. Entries made in these logbooks should be factual, clear, precise, and non-subjective. Field logbooks, and entries within, are not intended for personal use.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure consistency in recording information in field logbooks for Libby Site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

7.2 Field Checks

Field logbooks may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the author and corrected. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-1, Field Logbook Content and Control, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Photographic Documentation of Field Activities

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

Photographic documentation, which includes still and digital photography and videotape or digital versatile/video disc (DVD) recordings, is an essential tool to document field activities conducted by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for photographic documentation. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Arrows and Pointers – Used to indicate and/or draw attention to a special feature within the photograph.

Contrasting Backgrounds – Backdrops used to lay soil samples, cores, or other objects on for clearer viewing and to delineate features.

Data Recording Camera Back – A camera attachment or built-in feature that will record, at the very least, frame numbers and dates directly on the film. Digital cameras and recorders may also be equipped with a date stamping feature.

Identifier Component – Visual components used within a photograph such as visual slates, reference markers, and pointers.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Photographer – The camera operator (professional or amateur) for still photography, including digital photography, or videotape or DVD recording, whose primary function with regard to this SOP is to produce documentary or data-oriented visual media.

Reference Marker – A reference marker used to indicate a feature size in the photograph and is a standard length of measure, such as a ruler, meter stick, etc. In limited instances, if a ruled

marker is not available or its use is not feasible, it can be a common object of known size placed within the visual field and used for scale.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Slates – Blank white index cards, paper, or a dry-erase board used to present information pertaining to the subject/procedure being photographed. Letters and numbers on the slate will be bold and written with black indelible marking pens.

2.2 Discussion

Photographs and videotape or DVD recordings made during field activities are used as an aid in documenting and describing site features, sample collection activities, equipment used, and conditions during the field activity being performed. This SOP is designed to illustrate the format and desired placement of identifier components, such as visual slates, standard reference markers, and pointers. These items shall become an integral part of the "visual media" that, for the purpose of this document, shall encompass still photographs, digital photographs, videotape recordings (or video footage), and recordings on DVDs. The use of a photographic logbook and standardized entry procedures are also outlined. These procedures and guidelines will minimize potential ambiguities that may arise when viewing the visual media and ensure the representative nature of the photographic documentation.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for photographic documentation will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for ensuring that the format and content of photographic documentation are in accordance with this procedure. The TL is responsible for directing the photographer to specific situations, site features, or operations that the photographer will be responsible for documenting.

Photographer – The photographer shall seek direction from the TL and regularly discuss the visual documentation requirements and schedule. The photographer may be responsible for maintaining a logbook or itemization of photos/recordings or providing captions. Specific requirements will be defined in the governing document referencing this SOP.

4.0 Equipment

The following equipment may be used for photographic documentation:

- 35-millimeter (mm) camera and appropriate film (e.g., medium speed or multi-purpose fine-grain color)
- Disposable, single-use camera (35mm or panoramic use)
- Digital camera
- Video camera and appropriate storage media (e.g., videotapes, DVDs)
- Extra batteries
- Standard reference markers
- Slates

- Arrows or pointers
- Contrasting backgrounds
- Logbook
- Data recording camera back (if available)
- Indelible black or blue ink pen
- Storage medium for digital camera

5.0 Procedures

5.1 Preparation

In addition to this SOP, photographers must be familiar with all procedures applicable to the field activity being performed. These procedures should be consulted as necessary to obtain specific information about equipment and supplies, health and safety (including requirements for personal protective equipment at a site), sample collection, equipment and personnel decontamination, documentation, etc. These procedures should be maintained on site by field staff at all times for easy reference.

The photographer should also be aware of any potential physical hazards while photographing the subject (e.g., traffic, operating equipment, low overhead hazard, edge of excavation area).

If required, a commercially available, bound logbook will be used to log and document photographic activities. Alternatively, a portion of the field logbook may be designated as the photographic log and documentation section.

Because digital cameras and DVD recorders have multiple photographic quality settings, if not specified in the governing document referencing this SOP, the TL shall specify the resolution (quality) at which photographic documentation should be collected. It should be noted that a camera or DVD recorder that obtains a higher resolution (quality) has a higher number of pixels and will store a fewer number of photographs per digital storage medium.

5.2 Operation

The following sections provide general guidelines that should be followed to visually document field activities and site features using still/digital cameras and video equipment. Slate and caption information will not be required at the Libby Site unless specified in the governing document referencing this SOP.

5.2.1 Still Photography

Slate Information

Each new roll of film or digital storage medium will contain on the first usable frame (for film) a slate with consecutively assigned control numbers (a unique, consecutive number that is assigned by the photographer).

Caption Information

Still photographs will have a full caption permanently attached to the back or permanently attached to a photo log sheet. Digital photographs should have a caption added after the photographs are downloaded. Unless modified by the governing document referencing this SOP, captions should contain the following information:

- Film roll control number (if required) and photograph sequence number
- Site name or location

- Description of activity/item shown
- Date and time
- Direction (if applicable)
- Photographer

Close-up and Feature Photography
Close-up photographs should include a standard reference marker of appropriate size as an indication of the feature size.

Feature samples, core pieces, and other lithologic media should be photographed as soon as possible after they have been removed from their *in situ* locations to enable a more accurate record of their initial condition and color for formal lithologic observations and interpretations.

Site Photography
Site photography, in general, consists predominantly of medium- and wide-angle shots. A standard reference marker should be placed adjacent to the feature or, when this is not possible, within the same focal plane. While it is encouraged that a standard reference marker and caption/slate be included in the scene, it is understood that situations will arise that preclude their inclusion within the scene. This will be especially true of wide-angle shots. In such a case, the logbook (field or photographic), photographic caption, or digital file name shall specify all information pertinent to the scene.

5.2.2 Photographic Documentation Using Video Cameras
As a reminder, it is not within the scope of this document to set appropriate guidelines for presentation or "show" videotape or DVD recording. The following guidelines are set for documentary videotape or DVD recordings only and should be implemented at the discretion of the site personnel.

Documentary videotape or DVD recordings of field activities may include an audio slate for all scenes, as directed by the governing document referencing this SOP. At the beginning of each video session, an announcer will recite the following information: date, time (in military units), photographer, site ID number, and site location. This oral account may include any additional information clarifying the subject matter being recorded.

A standard reference marker may be used when taking close-up shots of site features with a video camera. The scene may also include a caption/slate. It should be placed adjacent and parallel to the feature being photographed.

A standard reference marker and caption/slate may be included in all scenes, as directed by the governing document referencing this SOP. The caption information is vital to the value of the documentary visual media and should be included. If it is not included within the scene, it should be placed before the scene.

Original video recordings will not be edited. This will maintain the integrity of the information contained on the videotape or DVD. If editing is desired, a working copy of the original video recording can be made.

A label should be placed on the videotape or DVD with the appropriate identifying information (project name, project number, date, location, etc.).

5.2.3 Photographic Logs

Photographic activities shall be documented in a photographic log or in a section of the field logbook, as directed by the governing document referencing this SOP. The photographer will be responsible for making proper entries.

The following information shall be maintained in the appropriate logbook:

- Photographer name
- Roll/tape/DVD control number (as appropriate)
- Sequential tracking number for each photograph taken (for digital cameras, the camera-generated number may be used)
- Date and time (military time)
- Location
- Description of the activity/item photographed
- Description of the general setup, including approximate distance between the camera and the subject
- Other pertinent information to assist in the identification of the subject matter

5.3 Post-operation

5.3.1 Processing

All film will be sent for development and printing to a photographic laboratory (to be determined by the photographer). The photographer will be responsible for arranging transport of the film from the field to the photographic laboratory. The photographer will also be responsible for arranging delivery of the negatives and photographs, digital storage medium, or videotape or DVD to the TL to be placed in the project file.

Digital media should be downloaded daily to a personal computer or secure server; the files should be in either “JPEG” or “TIFF” format. Files should be renamed at the time of download in accordance with any file-naming conventions required by the governing document referencing this SOP, or to correspond to the logbook. At a minimum, the file name should include the corresponding sampling location and/or sample number and the photograph date (e.g., “123 Elm St_2-15-2011”, “AA-12345_3-18-2009”).

5.3.2 Documentation

At the end of each day’s photographic session, the photographer(s) will ensure that all photographic documentation has been maintained in accordance with this SOP.

5.3.2 Archive

Unless otherwise specified in Libby Site data management requirements or the governing document referencing this SOP, digital photographs will be stored on a secure server (with a nightly backup) or posted to a web-based location (e.g., an eRoom or SharePoint portal). These files will be archived until project closeout, at which time project management will determine a long-term electronic file storage system.

6.0 Restrictions/Limitations

This document is designed to provide a set of guidelines for the field personnel to ensure that an effective and standardized program of visual documentation is maintained.

The procedures outlined herein are general by nature. The photographer is responsible for specific operational activity or procedure. Questions concerning specific procedures or requirements should be directed to the TL.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure quality photographic documentation is gathered to support site activities. Consistency will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require re-training of the field team members.

7.2 Field Checks

Photographic documentation processes may be checked for completeness and adherence to SOP requirements on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any errors noticed during the checks will be discussed with the photographer and corrected. If field activities continue beyond six months, the frequency of assessing photographic documentation will be established by the Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-2, Photographic Documentation of Field Activities, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Field Equipment Decontamination

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

Decontamination of field equipment is necessary to ensure acceptable quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off site. The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the decontamination of field equipment used by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Definitions

Clean – Free of contamination and when decontamination has been completed in accordance with this SOP.

Cross contamination – The transfer of contaminants through equipment or personnel from the contamination source to less contaminated or non-contaminated samples or areas.

Decontamination – The process of rinsing or otherwise cleaning the surfaces of equipment to rid them of contaminants and to minimize the potential for cross contamination of samples or exposure of personnel.

De-mineralized water – Water that has had most to all minerals removed from it. De-mineralized water shall only be stored in clean glass, stainless steel, or plastic containers that can be closed when not in use.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Material Safety Data Sheet (MSDS) – Document that discusses the proper storage and physical and toxicological characteristics of a particular substance used during field operations. MSDSs are to be maintained on site at all times during field operations.

Potable water – Tap water may be obtained from any municipal system. Chemical analysis of the water source may be required before it is used.

Sampling equipment – Equipment that comes into direct contact with the sample media. Such equipment includes split spoon samplers, well casing and screens, and trowels or bowls used to collect and/or homogenize samples.

Soap – Low-sudsing, non-phosphate detergent (e.g., Liquinox®).

Solvent rinse – Pesticide-grade (or better) isopropanol, acetone, or methanol.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for field equipment decontamination will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader - The TL is responsible for ensuring that field personnel are properly trained and that decontamination is conducted in accordance with this procedure and any other pertinent Libby Site decontamination processes cited in the governing document referencing this SOP.

Field Team Members – Field team members performing operations on the Libby Site are responsible for adhering to the procedures contained in this SOP and any other decontamination processes specified in the governing document referencing this SOP. If required, field team members will collect and document rinsate samples (also known as equipment blanks) to provide quantitative verification that these procedures have been correctly implemented. Field team members are also responsible for communicating any problems pertaining to the decontamination of field equipment to the TL.

4.0 Equipment

The following equipment may be employed wholly or in part during use of this SOP (refer to the governing document referencing this SOP for detailed requirements):

- Stiff-bristle scrub brushes
- Plastic buckets, scoops, trowels, and troughs
- Soap
- Nalgene® or Teflon® sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayers (pump sprayer material must be compatible with the solution used)
- Plastic sheeting, plastic bags, and/or aluminum foil to keep decontaminated equipment clean between uses
- Disposable wipes, rags, or paper towels
- Potable water (potable water may be required to be tested for contaminants before use)
- De-mineralized water
- Gloves, safety glasses, and other protective clothing as specified in the health and safety plan
- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source

- Tools for equipment assembly and disassembly
- 55-gallon drums or tanks for temporary storage of decontamination water
- Pallets for drums or tanks holding decontamination water

5.0 Procedures

All reusable equipment (non-dedicated) used to collect, handle, or measure samples shall be decontaminated before coming into contact with any sample media or personnel using the equipment. Decontamination of equipment shall occur either at a specified location, central decontamination station or at portable decontamination stations set up at the sampling location, drill site, or monitoring well location. The centrally-located decontamination area may include an appropriately-sized bermed and lined area on which equipment decontamination occurs and equipped with a collection system and/or storage vessels. In certain circumstances, berming may not be necessary when small quantities of water are being generated and for some short duration field activities. Equipment shall be transported to and from the decontamination area in a manner to prevent cross contamination of equipment and/or the area.

Typically at the Libby Site, decontamination water will not be captured and will be discharged to the ground at the site. However, the exact procedure for decontamination waste disposal may be discussed in the governing document referencing this SOP. Also, solvent rinse fluids may need to be segregated from other investigation-derived waste (IDW).

All items that come into contact with potentially contaminated media shall be decontaminated before use, between sampling locations (does not need to be performed between aliquots of an individual sample) and/or drilling locations, and after use. All decontamination procedures for the equipment being used are provided in the following sections.

General Guidelines

- Potable or de-mineralized water shall be free of all contaminants of concern. Depending upon the governing document referencing this SOP, analytical data from the water source may be required to ensure it is clean.
- Sampling equipment that has come into contact with oil and grease shall be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Regulatory or Libby Site-specific requirements regarding solvent use shall be stated in the governing document referencing this SOP.
- All solvents[1] shall be pesticide-grade or better and traceable to a source. The corresponding lot numbers shall be recorded in the appropriate field logbook.
- Decontaminated equipment shall be allowed to air dry before being used.
- Documentation of all equipment, including type of equipment, date, time, method of decontamination, and any associated field quality control sampling, shall be recorded in the field logbook.

[1]Solvents are potentially hazardous materials and must be handled, stored, and transported accordingly. Solvents shall never be used in a closed building. See the investigation-specific health and safety plan and/or the chemical's MSDS for specific information regarding the safe use of the chemical.

- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment shall be used as specified in the governing document referencing this SOP and/or health and safety plan.

5.1 Heavy Equipment Decontamination

Heavy equipment typically used at the Libby Site includes drilling rigs, trucks, and excavators. For any heavy equipment used during EPA response actions, the equipment decontamination procedures provided in the current version of the Libby Asbestos Site Response Action Work Plan shall apply. For all other field activities, follow these steps when decontaminating heavy equipment:

1. Establish a bermed decontamination area that is large enough to fully contain the equipment to be cleaned. If available, an existing wash pad or appropriate paved and bermed area may be used; otherwise, use one or more layers of heavy plastic sheeting to cover the ground surface and berms. All decontamination pads shall be upwind of the investigation area(s).
2. With the heavy equipment in place, spray areas (rear of rig or backhoe) exposed to contaminated media by pressurized means. Be sure to spray down all surfaces, including the undercarriage.
3. Use brushes, soap, and appropriate decontamination water to remove dirt whenever necessary.
4. Remove equipment from the decontamination pad.
5. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

5.2 Downhole Equipment Decontamination

Downhole equipment includes hollow-stem augers, drill pipes, rods, and stems. Follow these steps when decontaminating this equipment:

1. Set up a centralized decontamination area, if possible. This area shall be set up to collect contaminated rinse waters and to minimize the spread of airborne spray.
2. Set up a “clean” area upwind of the decontamination area to receive cleaned equipment for air-drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination areas shall be upwind of any areas under investigation.
3. Using soap and appropriate water with pressurization (e.g., Hudson® sprayer), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.
4. If using soapy water, rinse the equipment using clean appropriate water with pressurization.
5. Remove the equipment from the decontamination area and place in a clean area upwind to air dry.
6. After decontamination activities are completed, collect all plastic sheeting, and disposable gloves, boots, and clothing in containers or receptacles. All receptacles containing

contaminated items must be properly labeled for disposal as detailed in the governing document referencing this SOP.

5.3 Sampling Equipment Decontamination

Follow these steps when decontaminating sampling equipment:

1. Set up a decontamination line. The decontamination line shall progress from "dirty" to "clean." A clean area shall be established upwind of the decontamination wash/rinse activities to dry the equipment.
2. Disassemble any items that may trap contaminants internally. Do not reassemble the items until decontamination and air drying are complete.
3. Wash the items with appropriate water and soap using a stiff brush as necessary to remove particulate matter and surface films. With the exception of polyvinyl chloride or plastic items, the items may be steam-cleaned using soap and hot water as an alternative to brushing. Items that have come into contact with concentrated and/or oily contaminants may need to be rinsed with a solvent such as hexane and allowed to air dry prior to this washing step.
4. Thoroughly rinse the items with potable water.
5. If sampling for organic compounds, thoroughly rinse the items with solvent (e.g., isopropanol) followed by a rinse using de-mineralized water. The specific chemicals used for the solvent rinse phase shall be specified in the work plan. Solvents are potentially hazardous materials and care must be exercised when using these chemicals to prevent adverse health effects. Appropriate personal protective equipment (PPE) must be worn when using these chemicals. These chemicals (including spent rinsate) must be managed and stored appropriately. Special measures such as proper labels, paperwork, notification, etc. may be required when transporting or shipping solvent chemicals.
6. Rinse the items thoroughly using de-mineralized water.
7. Allow the items to air dry completely.
8. After decontamination activities are completed, collect all plastic sheeting, and disposable PPE. Place the contaminated items in properly labeled bags or containers for disposal. Refer to the governing document referencing this SOP for labeling and waste management requirements.

5.4 Pump Decontamination

Follow the manufacturer’s recommendation for specified pump decontamination procedures. At a minimum, follow these steps when decontaminating pumps:

1. Set up the decontamination area and separate “clean” storage area using plastic sheeting to cover the ground, tables, and other surfaces. Set up three containers: the first container shall contain dilute (non-foaming) soapy water; the second container shall contain potable water; and the third container shall contain de-mineralized water.
2. The pump shall be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first container. Pump soapy water through the pump assembly. Scrub the outside of the pump and other wetted parts with a metal brush.

3. Move the pump assembly to the potable water container while leaving discharge outlet in the waste container. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.
4. Move the pump intake to the de-mineralized water container. Pump the water through the pump assembly. Pump the volume of water through the pump specified in the field plan. Usually, three pump-and-line-assembly volumes shall be required.
5. Remove the decontaminated pump assembly to the clean area and allow it to air dry upwind of the decontamination area. Intake and outlet orifices shall be covered to prevent the entry of airborne contaminants and particles.

5.5 Instrument Probe Decontamination

Instrument probes used for field measurements (e.g., pH meters, conductivity meters) shall be decontaminated between samples and after use with de-mineralized water. At no time shall a sample probe be placed in contact with water within a sample container.

5.6 Waste Disposal

Waste disposal should follow the requirements listed in Libby project-specific SOP for handling investigation-derived waste (IDW) and the governing document referencing this SOP. The following are guidelines for disposing of waste:

- Decontamination water will typically not be captured, packaged, labeled, or stored as IDW at the site. Decontamination water will be discharged to the ground at the work site. Other materials used in the decontamination process will be disposed of as IDW.
- Small quantities of decontamination solutions may be allowed to evaporate to dryness.
- If large quantities of used decontamination solutions shall be generated, each type of waste shall be segregated in separate containers.
- Plastic sheeting and disposable protective clothing will be treated and disposed of as asbestos-containing materials.

6.0 Restrictions/Limitations

If the field equipment is not thoroughly rinsed and allowed to completely air dry before use, volatile organic residue, which interferes with the analysis, may be detected in the samples. The occurrence of residual organic solvents is often dependent on the time of year sampling is conducted. In the summer, volatilization is rapid, and in the winter, volatilization is slow. Check with EPA Region 8 and the State of Montana for approved decontamination solvents.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper field equipment decontamination, which will be achieved to the extent possible through proper training, use of designated field staff, and

provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Adherence to field equipment decontamination requirements may be checked on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue, and any non-compliance discussed with the field team member. If field activities continue beyond six months, the frequency of assessing field equipment decontamination will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 4-5, Field Equipment Decontamination, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Handling Investigation-derived Waste

Prepared by: _____ Date: 4/12/12
CDM Smith

Approved by: _____ Date: 4/12/12
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for handling investigation-derived waste (IDW) resulting from work performed by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Hazardous Waste – Discarded material that is regulated listed waste, or waste that exhibits ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.3 or state regulations.

Investigation-derived Waste (IDW) – Discarded materials resulting from field activities such as sampling, surveying, drilling, excavation, and decontamination processes that, in present form, possess no inherent value or additional usefulness without treatment.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

Treatment, Storage, and Disposal Facility (TSDF) – Permitted facilities that accept hazardous waste shipments for further treatment, storage, and/or disposal. These facilities must be permitted by the EPA and appropriate state and local agencies.

2.2 Discussion

At the Libby Site, field investigation and response action activities may result in the generation of IDW. IDW may include soil and cuttings from test pits or well installation; soil and other materials from the collection of samples; personal protective equipment (PPE); and other wastes or supplies used during the sampling and testing of potentially hazardous materials.

The vast majority of Libby Site IDW is expected to relate to the contaminant of concern – Libby amphibole asbestos. The overall management of IDW must comply with applicable regulatory requirements.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for handling IDW will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – The TL is responsible for identifying Libby Site-specific requirements for the disposal of IDW in accordance with federal, state, and/or facility requirements, and ensuring that all IDW procedures are conducted in accordance with this SOP. The TL will communicate with the field team members regarding the specific objectives and anticipated situations that require deviation from this SOP.

Field Team Members – Field team members are responsible for adhering to the procedures contained in this SOP, and communicating any unusual or unplanned condition to the TL.

4.0 Equipment

Equipment required for IDW containment may vary according to field activity requirements. Management decisions concerning the necessary equipment required shall consider containment method, sampling, labeling, maneuvering, and storage (if applicable). Equipment must be onsite and inspected before commencing work.

4.1 IDW Containment Devices

The appropriate containment device (e.g., bags, drums, tanks, etc.) and the ultimate disposition of the IDW shall be specified in the governing document referencing this SOP. Typical IDW containment devices include:

- Plastic sheeting (polyethylene) with a minimum thickness of 6 mil
- U.S. Department of Transportation (DOT)-approved steel containers
- Polyethylene or steel bulk storage tanks

The volume of the appropriate containment device shall be specified in the governing document referencing this SOP.

4.2 IDW Container Labeling

A “Waste Container” or “IDW Container” label or indelible marking shall be applied to each container. Labeling or marking requirements for onsite IDW not expected to be transported offsite are as detailed below.

- Labels and markings must contain the following information: project name, generation date, location of waste origin, container identification number, sample number (if applicable), and contents.

- Each label or marking will be applied to the upper one-third of the container at least twice, on opposite sides.

- Containers that are 5 gallons or less may only require one label or set of markings.

- Labels or markings will be positioned on a smooth part of the container. The label must not be affixed across container bungs, seams, ridges, or dents.

- Labels must be constructed of a weather-resistive material with markings made with a permanent marker or paint pen and capable of enduring the expected weather conditions. If markings are used, the color must be easily distinguishable from the container color.

- Labels will be secured in a manner to ensure that they remain affixed to the container.

Labeling or marking requirements for IDW expected to be transported off of the work site must be in accordance with the requirements of 29 CFR 1926.1101.

4.3 IDW Container Movement
Staging areas for IDW containers shall be predetermined and in accordance with investigation-specific requirements. Arrangements shall be made before field mobilization as to the methods and personnel required to safely transport IDW containers to the staging area. Transportation of IDW containers offsite via a public roadway is prohibited unless 49 CFR 172 requirements are met.

4.4 IDW Container Storage
Containerized IDW awaiting results of pending chemical analysis or further onsite treatment shall be staged on site. Staging areas and bulk storage procedures are to be determined according to investigation-specific requirements. Containers are to be stored in such a fashion that the labels can be easily read. A secondary/spill container must be provided for liquid IDW storage and as appropriate for solid IDW storage (e.g., steel drums shall not be stored in direct contact with the ground).

5.0 Procedures
The three general options for managing IDW are: 1) collection and onsite disposal; 2) collection for offsite disposal; and 3) collection and interim management. The option selected shall take into account the following factors:

- Type (soil, sludge, liquid, debris), quantity, and source of IDW
- Risk posed by managing the IDW onsite
- Compliance with regulatory requirements
- IDW minimization and consistency with the Libby Site remedy

5.1 Collection and Onsite Disposal
5.1.1 Soil/Sludge/Sediment
Unless otherwise specified in the governing document referencing this SOP, when handling soil/sludge/sediment IDW at the Libby Site, the following will apply:

- Return IDW to boring, pit, or source immediately after generation as long as returning the media to these areas will not increase site risks (i.e., the contaminated soil will not be in a different area or at a different depth than from where it was originally obtained).

5.1.2 Aqueous Liquids

Unless otherwise specified in the governing document referencing this SOP, options for handling aqueous liquid IDW at the Libby Site are listed below. These options may require results of laboratory analysis to obtain client and/or regulatory approval.

- Discharge to ground surface close to the well from which it was extracted, only if soil contaminants will not be mobilized in the process and the action will not contaminate clean areas. If IDW from the sampling of background up-gradient wells is not a community concern or associated with soil contamination, this presumably uncontaminated IDW may be released on the ground around the well.
- When small amounts (i.e., less than 5 gallons) of used decontamination fluids are generated during site characterization activities (e.g., during soil sampling), the fluids may be discharged to the ground surface within the sampling area or allowed to evaporate from an open bucket.

5.1.3 Disposable PPE

Disposable PPE IDW (not including excess soil volume) for the Libby Site will be collected in garbage bags and marked “IDW” with an indelible ink marker. These bags will be deposited into the asbestos-containing material (ACM) waste stream for appropriate disposal at the local Class IV asbestos landfill. Excess soil volume will be returned to the area from where it was collected.

5.2 Collection and Interim Management

Collection and interim management options that may be employed for Libby Site IDW are provided herein.

Storing IDW onsite until the final action may be practical in the following situations:

- Returning wastes (especially sludges and soils) to their onsite source area would require re-excavation for disposal as determined for the final site remedy.
- Interim storage in containers may be necessary to provide adequate protection to human health and the environment.
- Storing IDW until the final disposal of all wastes from the site will eliminate the need to address this issue more than once.
- Interim storage may be necessary to provide time for sampling and analysis.

6.0 Restrictions/Limitations

Managers of the site shall determine the most appropriate disposal option for IDW an activity-specific basis. Parameters to consider, especially when determining the level of protection, include: the volume of IDW and the nature of contaminants present in the site soil. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components and therefore may need to be handled, treated, and disposed as non-liquid waste. Disposable sampling materials, disposable PPE, decontamination fluids, etc. will always be

managed on a site-specific basis. Under no circumstances shall these types of materials be stored in a site office, facility, or warehouse.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper handling of IDW, which will be achieved to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Adherence to requirements for handling IDW may be checked on a daily basis by the TL (or their designate) for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require field team member re-training. If field activities continue beyond six months, the frequency of assessing field logbook entries will be established by the field Quality Assurance Manager or their designate.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-2, Guide to Handling Investigation-derived Waste, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Sample Custody

Prepared by: _____ Date: 3/19/15
CDM Smith

Approved by: _____ Date: 3/20/15
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--
1	3/19/15	Minor revisions to current sample custody procedures.

1.0 Objective

Sample custody procedures are integral to maintaining and documenting the possession of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for sample custody for the Libby Site. Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Facility – A designated sample processing facility, analytical laboratory, or long-term storage area, for Libby Site samples.

Field sample data sheet (FSDS) – A controlled document used to record sample information.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Sample – Material to be analyzed that is contained in single or multiple containers representing a unique sample number.

Sample custody – The possession or safe-keeping of samples in such a manner that prevents tampering, damage, or loss.

Sample labels – Adhesive-backed labels that contain, at a minimum, the unique sample number/identifier. Sample labels are typically used on field documentation, sample cassettes, and containers, and may be pre-printed to minimize sequencing or transcription errors.

2.2 Discussion

Because of the evidentiary nature of samples collected during environmental investigations, possession must be traceable from the time the samples are collected until their derived data are introduced as evidence in legal proceedings. To maintain and document sample possession, sample custody procedures must be followed.

3.0 Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for the custody of samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for ensuring that strict chain-of-custody procedures are maintained during all sampling events.

Sampler – Responsible for the care and custody of samples from the time of collection until they are transferred.

Field Sample Coordinator (FSC) – Responsible for accepting samples into their custody from the sampler(s), producing COCs, and relinquishing or shipping samples to the appropriate facility.

Laboratory Coordinator (LC) – Responsible for coordinating the preparation and/or analysis of Libby Site samples with project facilities in order to achieve requested turnaround times for analytical data.

4.0 Equipment

Depending upon staff responsibility, the following equipment will be employed during use of this SOP:

- Field logbook
- FSDSs
- Indelible blue or black ink pens
- Sample labels
- Zip-top plastic bags
- Custody seals
- COCs
- Container(s) in which to keep/protect samples

5.0 Procedures

5.1 Preparation

Communications between the TL, sampler(s), the FSC, the LC are critical to ensure the efficient throughput of samples to meet project data objectives. As such, an FSC will attend all field planning meetings to gather information about sampling events (e.g., sample quantities, special sample handling, processing, or analysis concerns, and requested turnaround times). For long-term field programs, sampling staff will notify the FSC daily of the estimated number and type of

samples to be collected. In either case, the FSC will relay the pertinent investigation-specific information to the LC, who will, in turn, coordinate preparation and/or analysis with project facilities. On an as-needed basis (typically daily during the field season), the FSC will schedule meetings in which to relinquish samples to the LC. The FSC will ship samples having quick turnaround times directly to the laboratory assigned by the LC.

5.2 Operation

A sample is under custody if it is: 1) in your possession, 2) in your view after being in your possession, 3) in your possession and you locked it up, or 4) in a designated secure area. The following procedures detail the process used to maintain the custody of each Libby Site sample. Note that if at any point samples are left unattended or receipt of samples is refused, this must be documented in the field logbook or on the COC, as appropriate.

5.2.1 Sampler Custody

Sample custody begins at the time of sample collection and will be maintained using a field logbook and FSDSs to document pertinent sample-related information. Samples will be placed in safe areas where they are protected from tampering, damage, or loss. Following sample collection, custody seals will be used as an indicator of tampering. Samples will remain in the sampler's possession, within sight, or in a secure area (e.g., locked vehicle) until the sample is relinquished.

For samples collected using zip-top bags as the primary container, all samples will be double-bagged and custody sealed on the outer bag by the sampler. For samples collected using cassettes, the cassette will be custody sealed so that both end caps of the sampling cassette are covered but sample labels or identifiers are not obstructed. The cassette will then be placed in a zip-top bag.

Sampler(s) may be required to transfer custody of samples directly to an FSC or a designated secure sample storage location, or to hand deliver or ship samples to a facility – refer to the governing document referencing this SOP for specifics. Project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*, will be followed for samples that are required to be shipped.

If relinquishing to an FSC or secure storage area, the sampler will note in the field logbook the time of transfer, and the name and company affiliation of the receiver or dedicated storage location. Completed and quality-checked FSDSs will accompany the samples.

5.2.2 FSC Custody

Upon receipt of samples and accompanying FSDSs, the FSC will verify that:

- Each FSDS is complete
- Each sample is accounted for
- Soil samples are double-bagged
- Each cassette is sealed in its own zip-top bag and caps on cassettes are in place
- Sample containers (e.g., bags, bottles) are tightly sealed
- Custody seals are correctly and securely placed on each sample
- Samples appear to be in an acceptable condition (i.e., cassettes are not cracked; sample

containers are not leaking, etc.).

- No information is provided on the sample or sample container that would disclose the origin of the sample to the facility

The FSC will immediately contact the sampler if any acceptance issues are encountered. Once accepted, the FSC will prepare a COC using EPA-specified data management tools (e.g., Data Entry Tool, Scribe). An investigation-specific Analytical Summary Sheet (available in the SAP or Libby Field eRoom) or applicable analytical parameters table will be attached to the COC. The FSC will group or batch the appropriate number of individual samples on a COC to facilitate data reporting, or as otherwise requested by the LC.

The following general batching guidelines will be used for commonly sampled Libby Site media:

- 10 or fewer non-clearance air samples on one COC
- one set of five clearance air samples and two corresponding field blanks on one COC
- 16 or fewer soil or soil-like (e.g., duff, wood chip) samples on one COC
- 10 or fewer dust samples on one COC

Following coordination with the LC, the FSC will hand deliver or ship samples (following project-specific SOP EPA-LIBBY-2012-07, *Packaging and Shipping Environmental Samples*) to the designated facility. All samples will be maintained in a secure location by the FSC until they are relinquished to another party.

5.3 Post-operation

Sample documentation (logbooks, FSDSs, field copy of the COC, etc.) will be maintained in accordance with Libby Site data management requirements and any special requirements stated in the governing document referencing this SOP (e.g., posting to an eRoom).

6.0 Restrictions/Limitations

For EPA Contract Laboratory Program sampling events, combined chain-of-custody/traffic report forms generated with Scribe or other EPA-specific records may be used. Refer to EPA regional guidelines for completing these forms. Scribe software may be used to customize sample labels and custody records when directed by the client.

7.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

7.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, use of designated field staff, and provision of TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

7.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL for the first week of each field activity. These checks can be extended to once per month as field activities continue. Any non-compliance issues will be discussed with field personnel and corrected. If field activities continue beyond six months, the frequency of assessing sample custody procedures will be established by the field Quality Assurance Manager.

8.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 1-2, Sample Custody, January 2012.

Libby Asbestos Superfund Site
Standard Operating Procedure
Packaging and Shipping Environmental Samples

Prepared by: _____ Date: 3/19/15
CDM Smith

Approved by: _____ Date: 3/20/15
EPA Region 8

Revision No.	Date	Reason for Revision
0	4/12/12	--
1	3/19/15	Minor revisions to current packaging and shipping procedures.

1.0 Objective

The objective of this standard operating procedure (SOP) is to establish baseline requirements, procedures, and responsibilities for the packaging and shipping of environmental samples collected by the U.S. Environmental Protection Agency or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Sections 2.0 through 7.0 of this SOP outline requirements for the packaging and shipping of regulated environmental samples under the U.S. Department of Transportation (DOT) Hazardous Materials Regulations, the International Air Transportation Association (IATA), and International Civil Aviation Organization (ICAO) Dangerous Goods Regulations (for shipment by air) and applies only to domestic shipments.

This SOP does not cover the requirements for packaging and shipment of equipment or bulk chemicals that are regulated under the DOT, IATA, and ICAO, nor does it address shipment of hazardous materials. Hazardous material will not be shipped unless personnel have received training that meets the requirements of the governing agency and the DOT.

Additions or modifications to this SOP may be detailed in governing documents referencing this SOP.

2.0 Background

2.1 Definitions

Bottle ware – Plastic or glass bottles or jars used to contain sampled material. Their purpose is to keep sampled material from mixing with the ambient environment.

Chain-of-custody record (COC) – Used to document the custody, control, transfer, analysis, and disposition of samples.

Custody seal – An adhesive-backed seal that is applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

Environmental sample – An aliquot of air, water, plant material, sediment, or soil that represents potential contaminant levels at a site. This procedure applies only to environmental samples that

contain less than reportable quantities for any foreseeable hazardous constituents according to DOT regulations promulgated in 49 CFR - Part 172.101 Appendix A.

Facility – A sample processing facility, analytical laboratory, or long-term storage area that serves as the receiver for Libby Site samples.

Excepted quantity – Excepted quantities are limits to the mass or volume of a hazardous material in the sample containers below which DOT, IATA, ICAO regulations do not apply. The excepted quantity limits are very low. Most regulated shipments will be made under limited quantity.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Limited quantity – Limited quantity is the maximum amount of a hazardous material below which there are specific labeling or packaging exceptions.

Performance testing – Performance testing is the required testing of outer packaging. These tests include drop and stacking tests.

Qualified Shipper – A qualified shipper is a person who has been adequately trained to perform the functions of shipping hazardous materials.

Site – All buildings (if applicable) and land within the boundaries of the EPA's designated geounits, which may represent individual properties within the Libby Site, a collection of properties, or a larger geographical area.

2.2 Discussion

Proper packaging and shipping is necessary to ensure the integrity of environmental samples during transport. These shipments are potentially subject to regulations published by DOT, IATA, or ICAO. Failure to abide by these rules places both the governing agency and the individual employee at risk of serious fines.

3.0 Responsibilities

Successful execution of this SOP requires a clear definition of assigned roles and responsibilities. All staff responsible for packaging or shipping Libby Site environmental samples will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this SOP.

Team Leader (TL) – Responsible for overseeing sample packaging and shipping processes as described in this SOP.

Packager/Shipper – Party (typically the Field Sample Coordinator or Sampler) responsible for properly packaging and shipping samples to the designated project facility.

Qualified Shipper – Responsible for ensuring that samples undergoing shipment contain no other contaminant that meets the definition of "hazardous material" as defined by DOT, and for determining the amount of preservative in each sample so that accurate determination of quantities can be made.

Laboratory Coordinator (LC) – Responsible for coordinating the preparation and/or analysis of Libby Site samples with project facilities in order to achieve requested turnaround times for analytical data.

4.0 Equipment

4.1 Environmental Samples without Preservatives

The following equipment will be used when packaging and shipping Libby Site samples:

- Shipping containers (e.g., insulated coolers, sturdy shipping boxes)
- Bubble wrap or other space filler
- Heavy-duty plastic garbage bags (as needed)
- Plastic zip-top bags
- Custody seals
- Clear packaging tape
- Completed chain-of-custody record
- Investigation-specific analytical requirements summary sheet (applicable to asbestos analysis)
- Analytical parameters table (if applicable)
- Contact, results distribution, or billing information (if applicable)
- Duct tape
- Completed shipping label
- Completed return address label (for return of coolers, as needed)

Vermiculite, shredded paper, expanded polystyrene, or other absorbent material will not be used for packaging or shipping Libby Site samples. Plastic bubble wrap and ice (as required) is acceptable packing material.

4.2 Environmental Samples with Preservatives

In addition to the equipment listed in Section 4.1, the following additional equipment is required when packaging samples containing preservatives:

- Sample containers
- Insulated coolers
- ice packs/bags
- Nitrile gloves

5.0 Procedures

5.1.1 Preparation

Considerations that must be made prior to shipping samples include consulting the LC to receive the laboratory assignment; selecting the appropriate shipping option (e.g., overnight delivery) so that analytical holding times for the samples are not exceeded; packaging samples in time to meet courier or shipping service pick-up times; and making arrangements with the project facility regarding Saturday receipt of samples.

5.2 Operation

5.2.1 Solid Media Samples without Preservatives

The following processes will be employed by the Packager/Shipper for non-preserved, solid media samples (soil, duff, bark, bulk material), and samples collected on cassettes (air, dust). Section 5.2.2 provides procedures for packaging and shipping aqueous samples (groundwater, surface water), or samples with aqueous content (sediment, sludge). Due to the potential for cross contamination, samples collected on cassettes must not be shipped in the same container

as solid media samples. Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Select a sturdy shipping container. Ensure that the container is in good repair. Air and dust samples must be shipped in separate containers from solid media samples.
3. Place samples into the shipping container. During placement, ensure custody seals are securely in place and verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the shipping container.
4. Fill all remaining space with bubble wrap or other appropriate space filler, to prevent the sample(s) from being jostled.
5. After the COC has been signed and dated (time included), retain the field copy of the COC. If using a cooler, place the following items into a zip-top plastic bag for inclusion in the cooler: the top copy of the COC, an analytical parameters table (if applicable), a copy of the investigation-specific analytical requirements summary sheet (applicable to any asbestos analysis), a completed return shipping label for return of a cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close. If using a box, include all aforementioned documentation inside the box along with the samples.
6. Attach a completed custody seal across the opening of the shipping container on opposite sides. If using a cooler, the cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
7. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
8. Once the container is shipped, notify the laboratory and/or LC of the shipment tracking number and anticipated arrival date/time.

5.2.2 Aqueous or Aqueous-Content Samples without Preservatives

This process below will be employed by the Packager/Shipper for non-preserved, aqueous (or aqueous content) samples collected in bottle ware (water, sediment, sludge). Refer to the guidance document referencing this SOP for temperature control requirements (ice).

1. Verify the samples undergoing shipment meet the definition of an “environmental sample” and are not a hazardous material as defined by DOT. Professional judgment and/or consultation with qualified persons such as the Health and Safety Manager shall be observed.
2. Be sure the caps on all bottles are tightened to prevent leaking.
3. For glass containers, wrap each container in bubble wrap and secure with waterproof tape to prevent breakage.
4. Place each plastic or bubble-wrapped glass container into a zip-top bag. Smaller glass containers, such as 40-milliliter vials, may be wrapped together for the same sample.

5. Remove as much trapped air when sealing the bag.
6. Select a sturdy cooler in good repair. To control contents: duct tape closed any interior drain plugs from the inside; duct tape closed any exterior drain plugs from the outside; and line the cooler with two large heavy-duty plastic garbage bags.
7. Place the samples into the cooler with sufficient space to allow for the addition of packing material between the samples. It is preferable to place glass sample bottles and jars into the cooler vertically (glass containers are less likely to break when packed vertically rather than horizontally). During placement, verify the contents of the shipping cooler against the COC. The COC shall reflect only those samples within the cooler.
8. Fill all remaining space with bubble wrap or other appropriate space filler to prevent the sample(s) from being jostled.
9. After the COC has been signed and dated (time included), retain the field copy of the COC. Place the following items into a zip-top plastic bag for inclusion in the cooler: the top copy of the COC, an analytical parameters table (if applicable), a copy of the Analytical Summary Sheet as provided in the governing document referencing this SOP (only applicable to asbestos analysis), a completed return shipping label for return of the cooler, and any additional contact, results distribution, or billing information. Tape the sealed zip-top bag to the inside of the cooler lid and securely close.
10. Fill all remaining space between the samples with packing material. Remove excess air from garbage bags and seal each bag by securely taping the opening closed and then applying a custody seal on the outermost bag.
11. Attach a completed custody seal across the opening of the cooler on opposite sides. The cooler lid shall be secured with tape by wrapping each end of the cooler a minimum of two times. The tape shall be affixed to the cooler so that only half of the custody seal is covered, preventing the cooler from being opened without breaking the seal.
12. Secure the completed shipping form to the shipping container. Schedule the container for pickup or drop off at shipper.
13. Once the container is shipped, notify the laboratory and/or LC of the shipment tracking number and anticipated arrival date/time.

5.2.3 Samples Requiring Temperature Controls

If temperature controls (i.e., ice) are required (refer to the guidance document referencing this SOP), in addition to the procedures listed in Section 5.2.1 (for solid media samples) or Section 5.2.2 (for aqueous samples), the Packager/Shipper will:

1. Duct tape closed any drain plugs (inside and outside) and line the cooler with two large heavy-duty plastic garbage bags. (This step will already have been performed for aqueous/aqueous-content samples.)
2. Place ice in plastic zip-top bags and properly seal the bags.
3. Place bags of ice on top of and between the samples to ensure adequate temperature controls during transport.
4. Ensure a temperature blank is secured inside the cooler.

5.2.4 All Samples with Preservatives

Prior to shipping samples with preservatives, the Qualified Shipper will determine the amount of preservative in each sample. Excepted quantities of preservatives are provided in the following table:

Excepted Quantities of Preservatives

Preservative		Desired in Final Sample		Quantity of Preservative (ml) for Specified Container				
5 drops = 1 ml		pH	Conc.	40 ml	125 ml	250 ml	500 ml	1 L
NaOH	30%	>12	0.08%	--	0.25	0.5	1	2
HCl	2N	<1.96	0.04%	0.2	0.5	1	--	--
HNO_3	6N	<1.62	0.15%	--	2	4	5	8
H_2SO_4	37N	<1.15	0.35%	0.1	0.25	0.5	1	2

Conc. = concentration
ml = milliliters
% = percent
L = liter
NaOH = sodium hydroxide
HCl = hydrochloric acid
HNO_3 = nitric acid
H_2SO_4 = sulfuric acid

In addition to the steps outlined in the appropriate section above for the specific media sampled, these additional steps are to be followed when packaging limited-quantity sample shipments:

1. Nitrile gloves are to be worn by anyone handling the sampling containers.
2. All sample containers will be labeled with the sample number and what preservative is being used. Protect the labels with waterproof tape. At a minimum the sample label must contain:

    - Sample number
    - Project or Case number
    - Date and time of sample collection
    - Preservative
    - Analysis

The FSDS will be used to collect all other sample information.

3. The Packager/Shipper will ensure a trip blank(s) is secured inside the cooler(s).
4. The maximum weight of the cooler shall not exceed 30 kilograms (66 pounds) for any limited-quantity shipment of dangerous goods.

5.3 Post-operation

Shipping documentation will be maintained by the Packager/Shipper to confirm that shipments have been delivered and accepted by the receiver.

6.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this SOP will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this SOP.

6.1 Training

Every effort will be made to ensure proper sample custody from the point of collection to final disposition. Sample custody will be maintained to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this SOP noted by the TL will require staff re-training.

6.2 Field Checks

Field checks for adherence to this SOP may be performed on a daily basis by the TL (or their designate) for the first week of each investigation. These checks can be extended to once per month as investigation activities continue, and any errors noticed during the checks will be discussed with field personnel and corrected. If investigation activities continue beyond six months, the frequency of assessing sample packaging and shipping procedures will be established by the field Quality Assurance Manager or their designate.

7.0 References

Adapted from CDM Smith Technical Standard Operating Procedure 2-1, Packaging and Shipping Environmental Samples, January 2012.

Libby Asbestos Superfund Site
Site-specific Procedure
Completion of Field Sample Data Sheets

Prepared by: Tracy Dodge Date: 3/23/16
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Reviewed by: Diane M Rode Date: 3/24/16
Diane Rode, CDM Smith Technical Reviewer

Reviewed by: Terry Crowell Date: 3/24/16
Terry Crowell, CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/8/02	--
1	5/16/03	Annual update to align guidance with current versions of FSDSs
2	--	Not finalized/approved
3	4/12/06	Annual update to align guidance with current versions of FSDSs
4	4/13/09	Annual update to align guidance with current versions of FSDSs
5	5/26/09	Minor administrative changes to address FSDS changes
6	4/18/12	Annual update to align guidance with current versions of FSDSs
7	3/27/14	Annual update to align guidance with current versions of FSDSs
8	3/17/15	Annual update to align guidance with current versions of FSDSs
9	3/25/16	Annual update to align guidance with current versions of FSDSs

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the completion of field sample data sheets (FSDSs) by the U.S. Environmental Protection Agency (EPA) or its contractors in support of the Libby Asbestos Superfund Site (Libby Site). Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Data Entry Tool (DET) – A local MS Access® tool used to enter information from the FSDS and temporarily store the information until it is published to Scribe.

Field sample data sheet (FSDS) – The hard copy form on which sample and location information is recorded.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map. Note that the Libby Site is organized into eight formal OUs (1-8), while OU99 is used exclusively in data management to identify properties that lie outside the EPA National Priorities

List Site boundary and properties where standard investigation and response action (RA) protocols do not apply.

Response Manager – An EPA data management system used to manage Libby Site property information.

Scribe – An EPA data management system used to manage location, sample, and analytical data.

3.0 Responsibilities

Team Leader (TL) – Responsible for ensuring that FSDSs are completed in accordance with this procedure and any additional FSDS requirements stated in the governing document referencing this procedure.

Sampler – Responsible for completing FSDSs in accordance with this procedure and any additional FSDS requirements stated in the governing document referencing this procedure.

Field Sample Coordinator (FSC) – Staff member to whom samples and FSDSs are relinquished; responsible for preparing chain-of-custody forms (COCs) and submitting samples to the appropriate project facility.

Office Administrator – Responsible for preparing sample number and location identification (ID) logs and labels, and preparing unique and sequentially numbered FSDSs for completion in the field.

4.0 Operation

4.1 Recording Information for All Sample Media

This section provides background information, as well as descriptions and instructions for completing FSDS data items common to all sample media. Data items specific to certain media are discussed in Section 4.2.

Some FSDS data items are required to be completed to be in compliance with EPA data reporting requirements or the governing document referencing this procedure, or to track other critical field information. These data items will be referred to as "required" throughout this procedure. Required data items are indicated on FSDSs with an asterisk (*). A required data item must be populated with an appropriate valid value. Note that "NA" (not applicable) may be a valid value.

Other data items may be required conditionally. These will be referred to as "conditional" throughout this procedure and these fields will not be asterisked on the FSDS. Conditional data items and any corresponding valid values may be specified in EPA data reporting requirements or the governing document referencing this procedure.

Data items that are not required or conditional may be left blank. Information recorded on the FSDS is entered into the DET.

Field team members are not required to line out any labels, initial, or date them, unless they are making a revision. To revise a data item on an FSDS, line through the incorrect data (single line), record the correct data in close proximity to the erroneous data, and date and initial the change.

Sheet No.: A pre-assigned unique, sequential sheet number assigned by an Office Administrator, in the format: $$-###### or $-######, where $ refers to the media being sampled and ###### refers to the sequential number.

Event ID: An identifier for a specific data collection effort, most commonly a combination of the event-specific sample number prefix and the approved date of the document governing the event. These Event IDs use the format: $-###### or $$-######, where $ or $$ is a one– or two-digit set of characters, as specified in the governing document referencing this procedure, and ###### refers to the governing document date in MMDDYY format.

Address: The concatenated address (as it appears in Response Manager) of the property being investigated and/or sampled.

Date: The date of sample collection in the format MM/DD/YY. For air samples collected over more than one day using the same cassette, the end date (i.e., date the sample period concludes) will be recorded.

Property ID: For non-OU7 properties, a unique identifier assigned to each property in the format: AD-######, where ###### is a unique number. OU7 and some OU99 Property IDs are in the format: AD-2#####. Property IDs should be verified using Response Manager before being transcribed onto the FSDS. Property IDs may be used as Location IDs in appropriate circumstances.

Field Logbook No.: The number of the logbook being used to record information specific to the samples on the FSDS.

Page No.: The page number(s) in the logbook being used to record information specific to the samples on the FSDS.

Sampler(s): The first initial and full last name of all members of the field team. For data entry, the FSC will select only one of the field team members listed. The company affiliation of the field team member(s) need only be listed after their name if they work for a company other than “CDM Smith”.

Location ID: A unique number assigned to each location representing the investigated and/or sampled area specific to the information on the FSDS. Previously assigned location IDs should be verified using Scribe before being transcribed to the FSDS, whenever possible. Contact a member of the onsite data management team for assistance with verification.

Location IDs in the format BD-###### will be assigned to (or used for, in the case of previously assigned building location IDs) habitable, fully enclosed primary or secondary buildings, including buildings that may have broken windows and/or missing doors. All primary and secondary buildings will be assigned a BD-###### number.

Location IDs in the format XX-###### will be assigned to secondary structures (e.g., open structures, 3-sided structures, carports, lean-tos, and enclosed buildings too small for human entry).

Location IDs in the format XX-###### will be assigned to outdoor investigation areas and may be used for any GPI soil samples collected, including samples collected within primary and secondary

buildings and secondary structures with prior approval by the TL. XX- location IDs will not be used during RA soil confirmation sampling.

For activity-based sampling (ABS) Events, there is flexibility for use of location IDs depending on benefits to data users. Typically, XX- location IDs are used to correlate samples if the samples are collected in the same area. The same XX- location ID will be used over the course of the entire ABS program to represent the same area sampled over multiple events. For ABS air samples, the same XX- location ID will correlate individual or multiple ABS actors (as will be specified in the document governing the ABS activity) and their low and high volume samples as one data set.

Personal air health and safety samples associated with ABS activities will utilize the same XX- location ID as the ABS samples being collected concurrently; however the health and safety samples will be designated "EXC" for 30-minute excursion samples and "TWA" for 8-hour time-weighted average samples, rather than "ABS" in the sample air type. Field blanks will be assigned the AD- number for the property where ABS activities are occurring.

Location IDs in the format SP-###### will be assigned to excavated soil areas (including areas with open structures) during RA soil confirmation sampling. SP- location IDs will be used for air and water monitoring events and fill material sampling, as specified in the governing documents referencing this procedure.

Non-ABS personal and stationary air samples typically use a previously assigned property ID or building location ID. If a new location ID is assigned, the Location portion of a Soil-like and Location FSDS will be completed in addition to the Air FSDS. At the discretion of the FSC, a Soil-like and Location FSDS may not need to be completed for new locations for ABS events where the governing documents specify location type = "NA" and location description = "property".

For lot blanks, "AD-OU4NA" is used for the property ID and location ID.

For field blanks, generally, the property ID where field samples are being collected is used for outdoor sampling, while the building location ID is used if sampling occurs indoors. For air field blanks, the location ID should be used that corresponds to the air space where the field blank is exposed (i.e., property ID for field blanks exposed in outdoor spaces; building location ID for field blanks exposed in indoor living spaces).

Sample ID: Unique number assigned to each sample in the format $-##### or $$-#####, where $ or $$ is a one– or two-digit set of characters indicating the governing document referencing this procedure, and ##### is a 5-digit sequential number.

For Field Team Completion, Completed by: Initials of the field team member, verifying that required data items on the FSDS have been completed correctly.

For Field Team Completion, Quality Checked (QC) by: Initials of the second field team member (independent of the member completing the FSDS) or other trained reviewer, verifying that required data items on the FSDS have been completed correctly.

For Data Entry, Entered by: Initials of the FSC or data entry staff performing data entry of FSDS information into the DET.

For Data Entry, QC by: Initials of the FSC or other trained reviewer verifying FSDS data entered into DET is complete and accurate.

4.2 Recording Location Information

The following sections provide instructions for recording location information on FSDSs. Note that new locations for air sampling locations must be recorded on a Soil-like Sample and Location FSDS.

Is this a new Location?: Indicate "Yes" when assigning a new Location ID, indicate "No" when a Location ID has previously been assigned, and indicate "Revised" when revising previously collected location data. If the response is "No", "Z" through the rest of the location section.

Location Type: Record the location type of the area being investigated and/or sample during the values or abbreviations as shown below. For RA confirmation soil samples, record "excavation area". In the case where collecting a confirmation soil sample is not possible or is not required due to the remedy implemented (e.g., soil removed from a pot/planter, protective barrier or cover placed over soil), record "inspection area". For perimeter or clearance air samples, or water samples, record "not applicable". Below are the values to be selected for RA location type:

EA – Excavation area
IA – Inspection area
NA – Not applicable

For General Property Investigation (GPI) locations/samples, select from the following values:

SUA – specific-use area
CUA – common-use area
LUA – limited-use area
NUA – non-use area
PB – primary building
SB – secondary building
SS – secondary structure

Location Description: Record the description of the area being investigated and/or sampled from the values listed below (do not abbreviate). Additional values may be added with prior approval by the TL and FSC.

alley	field (maintained)	parking lot (unpaved)	underneath porches/decks
animal pen	field (unmaintained)	planter **	underneath secondary building
apartment	firepit	play area	undeveloped area
barn	flowerbed	property	unexcavated area*
borrow source	former house	pumphouse	verge
brush	garage	road (paved)	walkway (paved)
building	garden	road (unpaved)	walkway (unpaved)
burnpile	greenhouse	root zone	wooded area
carport	house	shed	yard
corral	lean-to	shop	window well
crawlspace*	NA	shrub bed	
decorative	outhouse	stockpile	
driveway (paved)	park	trail (unpaved)	
driveway (unpaved)	parking lot (paved)		

(*) Used only for RA documentation when no sample is required.
(**) Used for GPI or RA documentation when no sample is required.

Location Area (ft^2): Record the square footage of the area to which the location and/or sample pertains. This data item may be left blank if not specified in the governing document referencing this procedure. Note: The location area value recorded on the FSDS may be superseded by a computer generated value without revision to the FSDS.

Location Comment: For GPIs, with the exception of buildings and country roads, record the material type applicable to a location, as specified in the GPI governing document. For sampling specified by other governing documents, select the location comment from the values below. This data item may be left blank if not required by the governing document referencing this procedure.

building	pea gravel	topsoil
chipped rock	potting soil	topsoil w/liner
common fill	sand	washed rock
country road	structural fill	wood chips
grass	tall grass	wooded area
landscape rock		

Location Comment 2: Record the detailed description of the location if not reflected in the location comment or location description. Such as to reference the BD- location where the sampled area does not equal the building footprint (e.g. Crawlspace of BD-000651, SW corner of BD-005467, Center of BD-009780). This data item may be left blank if not specified in the governing document referencing this procedure.

4.3 Recording Media-Specific Information

The following sections provide instructions for recording media-specific information on FSDSs. FSDS may be customized to accommodate event-specific data requirements (e.g., matrix, if other than soil); however, the TL will consult with the FSC prior to any field work to prepare any customized FSDSs.

4.3.1 Soil-Like Material

Use based on: To distinguish whether location information is assigned based on current use or reasonably anticipated future use (RAFU), check the appropriate box. If "Current Use" is selected, or the data item is not applicable (i.e., for non-GPI samples), no data will be entered. If marked "RAFU", the acronym will be appended to the Location Comment 2 information by the FSC.

Location Zone: Record the location zone if required by the governing document referencing this procedure. For GPIs, the location zone is the zone of the BD- location with the addition of an alpha character beginning with "A" (e.g. BD-004565 = 1, XX-006545 = 1A, XX-006546 = 1B, XX-006547 = 1C) When use areas of a property encroach on an adjacent property, those areas will be demarked with a "P" prefix (e.g., P21, P22, P23) in line with the usage property, but sampled with the ownership property. This data item may be left blank if not specified in the governing document referencing this procedure.

Visible Vermiculite: Record the total number of visual inspection points of no (N), low (L), intermediate (M), or high (H) levels of vermiculite observed during the semi-quantitative visual inspection for vermiculite. For visible vermiculite observations corresponding to a sample, the sum of these fields must equal the number of sample aliquots (e.g., 30). Values for visual inspection

point observations (N, L, M, or H) must be provided; record "0" to indicate no observations were required/made.

Soil Depth Top: Record the top depth of the sample/visual inspection observation, recorded in inches, in relation to ground surface. For samples collected below ground surface, record a positive, whole number. For samples collected above ground surface (e.g., vegetative samples), record a negative, whole number.

Soil Depth Bottom: Record the bottom depth of the sample/visual inspection observation, recorded in inches, in relation to ground surface. For samples collected below ground surface, record a positive, whole number. For samples collected above ground surface (e.g., vegetative samples), record a negative, whole number.

VV Sub Location: For GPI exterior samples, record "property (exterior)". For interior locations, select from the list below. If "other interior soil" is selected, record details in the visible vermiculite comments. This data item may be left blank if not specified in the governing document referencing this procedure. In the case where collecting a confirmation soil sample is not possible or is not required due to the remedy implemented (e.g., soil removed from a pot/planter, protective barrier or cover placed over soil), use the valid value of "RAC area" (i.e., response action completed area).

property (exterior)	RAC area	soil floor
basement	crawlspace	interior planter
other interior soil	cellar	

Visible Vermiculite Comments: Record any comments pertaining to the visual inspection observation. In the case where collecting a confirmation soil sample is not possible or is not required due to the remedy implemented (e.g., soil removed from a pot/planter, protective barrier or cover placed over soil), record the inspection area (e.g., IA1, IA2, IA3). This data item may be left blank if not specified in the governing document referencing this procedure.

Sample ID: Record the unique sample number assigned to each sample, as designated by the governing document referencing this procedure.

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: For RA confirmation soil samples, circle the appropriate clearance sequence. For all other samples, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Delineation sample?: This question is not a required database item, rather a cue for the sampler to record the parent sample ID the next field. Circle "No" or "Yes".

Sample Parent ID: For field QC samples (e.g., field duplicates), record the sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements. For other requirements using sample parent ID (e.g., delineation samples), refer to the governing document referencing this procedure.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or otherwise indicate the number of aliquots collected/inspected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: For exterior RA confirmation soil samples, provide the sampling area designation(s) corresponding to the draft redline sketch (e.g., EA1, EA2, EA3, RZ1, RZ2). For interior RA confirmation soil samples, record the building description and the sampling area designation(s) corresponding to the draft redline sketch location of where the sample was collected (e.g., Area 1 – greenhouse; Area 12 – pumphouse; Area 3 – crawlspace).

Sample Field Comments: Record any additional information that may be important to data users or information that may influence sample analysis (e.g., suspect presence of hydrocarbons). Circle priority to request an expedited turnaround time for a sample. TQA will also indicate the "Last Sample" collected on a property to aid in prioritizing sample processing. GPI will use this field to note if a location contains multiple subzones. Subzones occur when non-contiguous areas are combined into one location (e.g. three flowerbeds equal one location.) An entry of "3" before subzones in sample field comments indicates three non-contiguous areas. If no value is populated for subzones, or the word subzones is lined out, no entry is required in the DET. Refer to the governing document referencing this procedure for other specific requirements.

4.3.2 Stationary Air

As mentioned in Section 4.1, a previously assigned property ID or building location ID will be used on the FSDS for stationary air samples in most cases. Property IDs are used for stationary air samples collected outside buildings, while building location IDs are used for samples collected inside buildings. If a new location ID is assigned, the Location portion of the Soil-like and Location FSDS must be completed in addition to the Air FSDS.

Sample ID: A unique sample number assigned to each sample, as designated by the governing document referencing this procedure.

ABS: Record whether the sample was collected as part of an ABS program.

Sample Venue: Record whether the sample was collected indoors, outdoors, both, or NA. The Sample Venue for field blanks should be recorded as "NA". For samples collected inside a vehicle with the windows closed, circle "Indoor". For samples collected inside a vehicle with the windows open, circle "Both".

Sample PrePostClear: For RA clearance air samples, circle the appropriate clearance sequence. For all other samples, including field blanks, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, "LB" for lot blank, "DB" for drying blank, or write in an alternative sample type as specified in the governing document referencing this procedure.

Sample Parent ID: Applicable to the high-volume sample, when co-located high- and low-volume samples are collected. For the high-volume sample, record the low-volume sample ID as the sample parent ID. For the low-volume sample, the sample parent ID is left blank.

Sample Location Description: Provide a detailed description of the indoor or outdoor sample location. Record "blank" for field blanks. Refer to the governing document referencing this procedure for any additional requirements.

Sample Air Type: Circle the appropriate stationary air type (ambient or perimeter). The Sample air type for blanks should be recorded as "NA".

Sample Air Volume Type: When co-located high- and low-volume samples are collected, record "LV" for low-volume or "HV" for high-volume samples. Record "NA" for all other samples.

Flow Meter Type: Circle the applicable flow meter used. Circle "NA" for all types of blank samples.

Cassette Lot Number: Record the cassette lot number of the sample cassettes being used.

Flow Meter ID Number: Record the identification number of the flow meter used. If more than one flow meter is used, use sample field comments to record the additional flow meter ID(s).

Pump ID Number: Record the ID of the pump used. If more than one pump is used, use sample field comments to record the additional pump ID(s), and provide the reason for use of multiple pumps. For all types of blank samples, "Z" out the data items from "Pump ID" to "Sample Air Stop Flow".

Sample Air Start Date: Record the start date in the format MM/DD/YY. Note that multiple start and stop dates/times, as well as start and stop flow rates, may need to be recorded for samples collected over multiple days using the same cassette. Refer to the governing document referencing this procedure for additional requirements.

Start Time: Record the starting time (in military units) of each air sample aliquot.

Start Flow: Record the starting pump flow rate, in liters per minute (L/min) for the air sample collected.

Stop Date: Record the stop date in the format MM/DD/YY.

Stop Time: Record the stopping time (in military units) of each air sample aliquot.

Stop Flow: Record the stopping pump flow rate (in L/min) for the air sample collected. If a flow rate is recorded while the pump is running, the stop time and next recorded start time will be the same.

Pump Fault: Circle "Y" or "N" to indicate a pump fault. For all types of blank samples, circle "NA". Use Sample Field Comments to note if a pump faulted during air sample collection, as determined by an unacceptable flow rate deviation (refer to the governing document referencing this procedure for flow rate requirements), or due to a mechanical fault (pump shut-off).

Sample Total Time (min): Sample total time is the total sample collection period in minutes (min). TLs will provide direction on calculating sample times. Generally, sample total times will be calculated by the FSC.

Sample Quantity (L): The sample quantity represents the total volume in liters (L) of the sample collected. TLs will provide direction on calculating sample quantities. Generally, air sample quantities will be calculated by the FSC.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

Filter Diameter: For all standard Libby Site air sampling, sample cassettes with a 25-millimeter filter diameter will be used. This data item is pre-printed on the Air FSDS.

Pore Size: For standard Libby Site air sampling, sample cassettes with a 0.8-micron filter pore size will be used. This data item is pre-printed on the Air FSDS.

4.3.3 Personal Air

Complete Personal Air FSDSs as for Stationary Air, with the following adjustments:

Sample PrePostClear: For all personal air samples and blanks, circle "NA" unless otherwise specified by the governing document referencing this procedure.

Sample Air Type: Circle one of the following personal air types:

- TWA – Time-weighted average sample, collected over an 8-hour period (may be composited with other personal air samples to represent an average work day)
- EXC – Excursion sample, collected over a 30-minute period (time may be approximate)
- ABS – Sample collected during activity-based sampling (<u>not</u> health and safety related)
- NA – Use for all types of blank samples, or as otherwise specified in the governing document referencing this procedure

Personnel ID: Record the company-assigned ID of the worker being monitored.

Name: Record the first and last name of the worker being monitored.

Personnel Task: For health and safety-related samples, select from the list below. For samples collected as part of ABS, refer to the governing document referencing this procedure for requirements.

bulk removal	investigation (Level D)	removal oversight (Level D)

demolition	laborer	support personnel
detailing attic	operator	truck driver (Level C)
excavator operator	other	truck driver (Level D)
investigation (Level C)	removal oversight (Level C)	wet wipe/HEPA vac living space
post removal interior demo	post removal ERS	

For samples collected at Rainy Creek Rd or Lincoln County Landfill, select the most appropriate value from the list above, and then provide additional information in sample field comments from the list below:

upper dozer	laborer - PAPR
water truck driver – PAPR	equipment operator - PAPR
truck driver – PAPR	truck driver – Level C and Level D

4.3.4 Bulk-Like Material

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Matrix if other than Bulk: Record tissue, ash, or other bulk-like material here.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: For RA-related samples, circle the appropriate clearance sequence. For all other samples, circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Sample Parent ID: For field QC samples (e.g., field duplicates), record the sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or otherwise indicate the number of aliquots inspected/collected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: Record any detailed location information that may not be reflected in the general location description, such as specific location within the building that was sampled (e.g., chimney; chinking SW wall). Refer to the governing document referencing this procedure for any specific requirements.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

4.3.5 Water

Sample Time: Record the time (in military units) the sample was collected.

ABS: Record whether the sample was collected as part of an activity-based sampling program.

Sample Venue: Record whether the sample was collected indoors or outdoors. Record "NA" for field blanks.

Sample PrePostClear: Circle "NA" unless otherwise specified in the governing document referencing this procedure.

Sample Type: Circle "FS" for a field sample, "FD" for a field duplicate, or write in an alternative sample type if specified in the governing document referencing this procedure.

Sample Parent ID: For field QC samples (e.g., field duplicates), record the sample ID of the parent field sample. Refer to the governing document referencing this procedure for field QC sample requirements.

Composite: Indicate if the sample collected is a composite of multiple aliquots. Circle "N" if the sample is a grab sample.

Sample/Inspection Aliquots: For 30-point composite samples, circle "30", or otherwise indicate the number of aliquots inspected and/or collected in the space provided. If a grab sample was collected, circle "0".

Sample Location Description: Record any detailed location information that may not be reflected in the general Location Description. Refer to the governing document referencing this procedure for any specific requirements.

Sample Field Comments: Record any additional information that may be important to data users. Refer to the governing document referencing this procedure for any specific requirements.

Libby Asbestos Superfund Site
Site-specific Procedure
30-point Composite Sampling of Surface Soil for Asbestos

Prepared by: _____ Date: 4-1-14
CDM Smith

Reviewed by: _____ Date: 4/1/14
CDM Smith Technical Reviewer

Reviewed by: _____ Date: 4/1/14
CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/7/02	--
1	5/17/03	• Administrative updates • Updated land use area designations • Updated sampling approach to collect samples in large land use areas (driveways and yards) where vermiculite is observed
2	5/10/07	• Administrative updates • Addition of Responsibilities and Sample Custody sections • Separate QA/QC requirements into new section • Updated sampling approach and collection requirements, including: – subsample requirements changed from 5-point to 30-point – refinement of property zone definitions and sizes – updated land use area designations – changes in sample depth increments for use areas – use of formalized procedure for the semi-quantitative estimation of visible vermiculite in soil
3	5/1/12	• Administrative updates • Eliminate the use of bowls used to homogenize soil samples • Eliminate the use of aluminum foil for wrapping re-usable sampling equipment during transport • Addition of reference to Libby Site-specific standard Operating Procedures throughout • Change in composited soil sample size from 2,000 – 2,500 grams to 750 – 1,000 grams
4	2/12/13	• Clarify the definition of visible vermiculite
5	4/1/14	• Administrative updates • Addition of Secondary Structure to use areas

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the collection of 30-point composite surface soil samples by the U.S. Environmental Protection Agency (EPA) or its contractors related to investigations conducted at the Libby Asbestos Superfund Site (Libby Site). This procedure describes the equipment and operations to be used for sampling surface soils for the analysis of Libby amphibole asbestos. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Composite sampling – A sampling approach in which multiple sample points are compiled together and submitted for analysis as a single sample.

Field sample data sheet (FSDS) – The controlled (i.e., pre-numbered and tracked) hard copy form on which sample and location information, and any visible vermiculite observations, is recorded.

Land use area – A portion of a property segregated according to how the property owner uses the area.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the current version of the OU boundary map.

Point inspection (PI) – A PI is an intrusive visual inspection of the top portions of the soil at a randomly selected point within a land use zone. A PI consists of the active displacement of the surface soil with a small shovel and visual inspection of the displaced soil and surface soil within an approximate 2-foot radius of the displaced soil (i.e., immediate field of view) for visible vermiculite (VV). If VV is observed during the PI, the location and a semi-quantitative estimate of VV will be recorded.

Subsample – The portion of a composite sample representing a discreet location within the sampled area.

Visible Vermiculite – Exfoliated and/or unexfoliated vermiculite, amphibole asbestiform minerals, and mine tailings present in soils as part of response actions – herein collectively referred to as visible vermiculite (VV).

3.0 Responsibilities

Successful execution of this procedure requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for collecting soil samples using this procedure will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this procedure.

Team Leader (TL) – The TL is responsible for overseeing the sample collection process outlined in this procedure, and for checking and verifying that the work performed satisfies the objectives of the governing document referencing this procedure. The TL will communicate with the field team members regarding specific collection objectives, and will communicate the need for any deviations from this procedure with the appropriate client personnel, and document the deviations using a Libby Field Record of Modification Form, as provided in the governing document referencing this procedure.

Field Team Members - Field team members performing the sampling described in this procedure are responsible for adhering to the tasks specified herein. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of sample points, within the boundaries outlined by the TL.

4.0 Equipment

The following equipment will be used during implementation of this procedure:

- Measuring tape or wheel – Used to estimate the square footage of each land use area.
- Pin flags – Used to identify subsample points within each sampling area.
- Trowel or push probe
- Shovel
- Gallon-sized plastic zip-top bags – Used to homogenize soil subsamples following collection (two bags per sample).
- Personal protective equipment (PPE) – For personal protection and to prevent cross-contamination of samples (e.g., disposable, powderless plastic or latex gloves).
- Field sprayers – Used to suppress dust during sample collection and to decontaminate non-disposable sampling equipment between samples.
- De-mineralized water – Used in field sprayers to suppress dust and to clean and decontaminate sampling equipment.
- Plastic bristle brush – Used to clean and decontaminate sampling equipment.
- Alconox – Used to clean and decontaminate sampling equipment weekly.
- Paper towels – Used to dry decontaminated sampling equipment.
- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).
- Trash bag – Used to store and dispose of general trash.
- Indelible ink pen (blue or black ink only)
- Field logbook – Used to record progress of sampling effort and record any problems and field observations.
- Blank FSDSs

- Sample Identification (ID) Labels – Pre-printed self-adhesive stickers used to label sample containers and on field documentation (e.g., FSDSs).
- Cooler or other rigid container – Used to store samples while in the field.
- Custody Seals – Self-adhesive seals applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

5.0 Sampling Approach

Upon arrival at each property, the field team will locate all parcels requiring sample collection depending on the investigation-specific objectives detailed in governing guidance documents. Parcels on a property will be sectioned into zones that share a similar land use. Zones established by land use areas may be subdivided based on site conditions (e.g., access, construction setup considerations, etc.). Use areas include:

- Specific-use area (SUA): flowerbed, garden, stockpile, play area, dog pen, driveway (non-paved), parking lot (non-paved), road (non-paved), alley (non-paved), fire pit/burn pile
- Common-use area (CUA): yard, former garden, former flowerbed, walkway, maintained/mowed field
- Limited-use area (LUA): pasture, un-maintained field, overgrown areas with trails/footpaths, overgrown areas in between SUAs/CUAs
- Non-use area (NUA): wooded lot,. NUAs will be identified but will not be sampled because they are not presently considered a complete exposure pathway. However, to the extent that NUAs may become a complete exposure pathway in the future, they may be revisited.
- Primary building (PB): crawlspace, earthen basement
- Secondary building (SB): soil floor of garage, pumphouse, shed, greenhouse, etc.
- Secondary structure (SS): lean-to, barn

After areas have been designated as zones (i.e., SUA zones, CUA zones, LUA zones, etc.), the field team will measure the zones with a measuring wheel and label the zone type and approximate square footage on the field sketch and/or design drawings. This procedure does not specify a minimum or maximum square footage restriction on any zone; however, the governing document referencing this procedure may specify zone size.

In establishing zones at the property, no area type may be combined with any other area type. For example, driveways and flowerbeds are both SUAs but will be separated into unique zones for soil sampling. Similarly, large CUAs such as yards may be subdivided into front yard, side yard, and back yard zones dependent on site conditions. Sectioning properties into additional zones will be at the discretion of the TL but consistent among the teams. Conversely, not all land use areas previously mentioned will be applicable at every property.

It is anticipated that SUA, SS, PB, and SB zones will generally tend to be smaller areas. Combining small, proximal SUAs of similar type into one zone will be at the discretion of the TL but consistent

among teams (e.g., two separate flowerbeds). With the exception of proximal SUAs, all other land use areas will be contiguous when establishing zones at each property.

Composite sampling requires soil collection from multiple (subsample) points. Composite samples will be collected from similar land use areas (i.e., SUA, CUA, etc.) and will not be combined with any other use area.

For SUAs (e.g., driveway, garden, flowerbed), composite samples will be collected from the 0- to 6-inch depth interval. If a depth of 6 inches cannot be attained given the varying levels of compaction in driveways, roads, etc. the maximum depth attainable will be documented on the FSDS. For non-SUAs (e.g., yard, former flowerbed, crawlspace, etc.), composite samples will be collected from the 0- to 3-inch depth interval. All composite soil samples will have 30 subsamples (i.e., 30-point composite sample) of approximately equal size for a final sample volume between 750 and 1,000 grams. Table 1 lists the sample depth for each type of land use area.

Table 1. Sampling Area and Depth

Land Use Area	Sampling Depth Increment (inches)
Specific-use Area (SUA)	0 – 6
Common-use Areas (CUA)	0 – 3
Limited-use Area (LUA)	0 – 3
Non-use Area (NUA)	Not Sampled
Secondary structure (SS)	0 – 3
Secondary Building (SB)	0 – 3
Primary Building (PB)	0 – 3

In cases where an SS or SB is used in the same manner as an SUA (e.g., a greenhouse where part or all of the soil floor is used as a garden), the sampling team shall use the more conservative (i.e., deeper) sampling depth.

As each subsample is collected, the soil will be inspected for VV and the location and semi-quantitative estimates of VV will be recorded on the FSDS in accordance with the current version of CDM-LIBBY-06 (Semi-Quantitative Visual Estimation of Vermiculite in Soil). Areas with VV will not be sampled with areas that do not have VV. However, if an SUA is less than 1,000 square feet (ft^2), it is not necessary to split it into samples with and without VV.

6.0 Sample Collection

Don the appropriate PPE as specified in the governing health and safety plan and/or governing document referencing this procedure. A new pair of disposable gloves will be worn for each sample collected. Segregate land use areas on the property into zones as described in Section 5.0. To reduce dust generation during sampling, use a sprayer with de-mineralized water to wet each subsample location prior to collection. Use the trowel to check beneath the surface soil layer, but do not advance more than 6 inches. If VV is observed, record the information on the field sketch or design drawing.

Within each zone, select 30 subsample locations equidistant from each other. These 30 subsample locations will comprise the 30-point composite sample for that zone. All composite subsamples will originate from the same land use area – do not mix subsamples from one land use area with subsamples from a different land use area.

Clean the subsample locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel or push probe, excavate a hole in the soil approximately 2 inches in diameter and 6 inches deep for SUAs, or 3 inches deep for non-SUAs. Conduct PI and place the material into the zip-top plastic bag. Repeat this step for each subsequent subsample until the appropriate number of composite subsamples has been collected. VV observations associated with a sample will be recorded on the FSDS as described in the current version of CDM-LIBBY-06 (Semi-Quantitative Visual Estimation of Vermiculite in Soil).

Homogenize the sample as required by the governing document referencing this procedure. Once the sample is homogenized, fill the zip-top plastic bag approximately a quarter full (750 – 1,000 grams of material). Affix the sample ID label to the inside of the bag and write the sample ID number on the outside of the bag, or affix an additional label using clear packing tape. The sample ID number format will be specified in the governing document referencing this procedure. Double bag the sample and repeat the labeling process for the outer bag.

Decontaminate equipment between composite samples (not between subsamples of one sample), as discussed in Section 7.2 below.

Repeat steps outlined above until all samples from a property have been collected. Refer to Section 8.2 for field quality control (QC) sample requirements.

7.0 Associated Procedures

7.1 Field Documentation

Field documentation for samples collected using this procedure will follow the current versions of CDM-LIBBY-03 (Completion of Field Sample Data Sheets) and EPA-LIBBY-2012-01 (Field Logbook Content and Control) unless otherwise specified in the governing document referencing this procedure.

7.2 Field Equipment Decontamination

All reusable sampling equipment must be decontaminated between composite samples in accordance with EPA-LIBBY-2012-04 (Field Equipment Decontamination) unless otherwise specified in the governing document referencing this procedure.

7.3 IDW

IDW will be managed as described in EPA-LIBBY-2012-05 (Handling IDW) and any other applicable governing documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas such as playgrounds are sampled, refilling the soil plug is not necessary. Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Spent wipes, gloves, and PPE must be disposed of or stored properly as IDW in accordance with EPA-LIBBY-2012-05 (Handling IDW) unless otherwise specified in the governing document referencing this procedure.

7.4 Sample Custody, Packaging, and Shipping

Sample custody requirements for samples collected using this procedure will follow the current version of EPA-LIBBY-2012-06 (Sample Custody), unless otherwise specified in the governing document referencing this procedure.

As may be applicable, sample packaging and shipping will follow the procedures outlined in EPA-LIBBY-2012-07, unless otherwise specified in the governing document referencing this procedure.

8.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this procedure will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this procedure.

8.1 Training

Every effort will be made to ensure consistency in collecting surface soil samples in support of the Libby Site. Consistency will be achieved to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this procedure noted by the TL will require re-training of field team members.

8.2 Field Quality Control Samples

Soil field duplicate samples will be collected at the rate specified in the governing document referencing this procedure. Field duplicate samples will be collected as co-located samples in the same zone as the parent sample. The duplicate will be collected from the same number of subsamples as the parent sample, but the subsample locations of the duplicate sample will be randomly located in the zone. The inspection for VV at each subsample location will follow the same protocol as referenced above. These samples will be independently collected with separate sampling equipment or with the original sampling equipment after it has been properly decontaminated. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing document referencing this procedure. These samples will be used to determine the variability of sample results in a given land use area, but will not be used to determine variability in sampling technique.

APPENDIX B

Operable Unit 6 Right-of-Way Confirmation Surface Soil Sampling

30-Point Composite Sampling of Surface Soil for Asbestos

Revision 0

Prepared By: _____ Date: 11 August 2016
Kennedy/Jenks Consultants

Reviewed By: _____ Date: 11 August 2016
BNSF Railway Company

Reviewed By: _____ Date: _____
CDM Smith Technical Reviewer

Reviewed By: _____ Date: _____
CDM Smith Quality Assurance Reviewer

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the collection of 30-point composite surface soil samples by BNSF Railway Company (BNSF) or its contractors related to sampling efforts conducted at the Libby Asbestos Superfund Site Operable Unit 6 (OU6). The composite surface soil samples are confirmation samples to be collected within BNSF's right-of-way (ROW) between the following approximate sets of BNSF mile posts (MPs)[1]:

- MP 1301 (eastern edge of OU6) to MP 1312 (eastern edge of "Investigation Complete" area)
- MP 1320 (western edge of "Investigation Complete" area) to MP 1336.33 (eastern end of Troy Tunnel)
- MP 1336.58 (western edge of Troy Tunnel) to MP 1342 (western edge of OU6).

This procedure describes the equipment and operations to be used for sampling surface soil for the analysis of Libby amphibole asbestos. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Composite sampling – A sampling approach in which multiple sample points are compiled together and submitted for analysis as a single sample.

Composite sample – A composite surface soil sample representative of approximately 1,000 linear feet of the OU6 ROW, consisting of 30 discrete sample points (aliquots).

Confirmation sampling – Collection of composite surface soil samples in accordance with this Quality Assurance Project Plan (QAPP).

[1] As shown on Figure B-3 of the QAPP, the investigation at the Libby Railyard is designated as complete.

Field sample data sheet (FSDS) – The controlled (i.e., pre-numbered and tracked) hard copy form on which sample and location information, and any visible vermiculite observations, are recorded.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the United States Environmental Protection Agency's (EPA's) designated operable units (OUs), as illustrated on the current version of the OU boundary map.

Milepost (MP) – Signs installed by BNSF at approximate mile intervals to reference locations along the tracks. The distance between mileposts varies significantly and is infrequently exactly 5,280 feet in length.

Operable Unit 6 (OU6) – The portion of the Libby Site owned and operated by BNSF. OU6 enters the eastern side of the Libby Site at approximately MP 1301 and leaves the western side of the Libby Site at approximately MP 1342.

Surface soil – Soil located between the ground surface and a maximum depth of 6 inches below ground surface (bgs).

Visible vermiculite – Exfoliated and/or un-exfoliated vermiculite, amphibole asbestiform minerals, and mine tailings present in soils, herein collectively referred to as visible vermiculite (VV).

3.0 Responsibilities

Successful execution of this procedure requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for collecting surface soil samples using this procedure will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this procedure.

Team Leader (TL) – The TL is responsible for overseeing the sample collection process outlined in this procedure, and for checking and verifying the work performed satisfies the objectives of the governing document referencing this procedure. The TL will communicate with the field team members regarding specific collection objectives, and will communicate the need for any deviations from this procedure with the appropriate client personnel, and document the deviations using a Libby Field Record of Modification Form, as provided in the governing document referencing this procedure.

Field Team Members – Field team members performing the sampling described in this procedure are responsible for adhering to the tasks specified herein. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of soil aliquots, within the boundaries outlined by the TL.

4.0 Equipment

The following equipment will be used during implementation of this procedure:

- Measuring tape or wheel – Used to estimate the length between sample points/aliquots parallel to the railroad track.

- Global Positioning System (GPS) – Used to (1) determine and record the location of beginning point (eastern end) of each composite sample interval with respect to the centerline of railroad mainline track, (2) to verify approximate railroad ROW boundaries, (3) to record soil sample point/aliquot locations, (4) to record observed locations of suspected VV; VV will be further delineated and sampled as a separate, follow-up sampling effort.

- Pin flags – Used (as-needed) to identify soil aliquot locations within each sub-composite sampling area for staff's visual tracking; sample locations will be recorded with the GPS.

- Digital camera – Used to provide photographic documentation of site conditions at time of sampling and delineation.

- Trowel or push probe.

- Shovel or trowel.

- Gallon, or larger sized plastic zip-top bags – Used to contain and homogenize sub-composite samples following collection.

- Plastic 5-gallon pails with lids or cooler–composite soil samples will be stored and transported in a closed pail or cooler until relinquished.

- Personal protective equipment (PPE) – For personal protection and to prevent cross-contamination of samples (e.g., disposable, powder less plastic or latex gloves).

- Field sprayers – Used to suppress dust during sample collection and to decontaminate non-disposable sampling equipment between composite samples.

- De-mineralized water – Used in field sprayers to suppress dust at soil aliquot locations and to clean and decontaminate sampling equipment.

- Plastic bristle brush – Used to clean and decontaminate sampling equipment.

- Alconox - Used to clean and decontaminate sampling equipment weekly.

- Paper towels – Used to dry decontaminated sampling equipment.

- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).

- Trash bag – Used to store and dispose of general trash.

- Indelible ink pen (blue or black ink only).

- Field logbook – Used to record progress of sampling effort and record any problems and field observations.

- Blank FSDSs.

- Sample identification (ID) labels – Pre-printed self-adhesive stickers used to label sample containers and on field documentation (e.g., FSDSs).

- Cooler or other rigid container – Used to store samples while in the field.

- Custody Seals – Self-adhesive seals applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

5.0 Sampling Approach

The ROW confirmation surface soil sampling (ROW Confirmation Sampling) approach is presented in Section 5.1 of the QAPP. Areas with VV will be identified and location recorded during the ROW Confirmation Sampling. Section 5.2 of the QAPP presents the procedures to document the presence of VV during ROW Confirmation Sampling.

5.1 Confirmation Sample Collection

As shown on Figure B-4, surface soil in the ROW Confirmation Sampling Area is divided into three continuous sampling areas: between BNSF MP 1301 to 1312, between MP 1320 to 1336.33, and between MP 1336.58 to 1342. The following table summarizes the anticipated number of composite surface soil samples to be collected:

ROW Confirmation Sampling Area	Anticipated Composite Samples
BNSF MP 1301 to 1312	68
MP 1320 to 1336.33	85
MP 1336.58 to 1342	33
Total Composite Confirmation Samples (not including duplicates):	186

Each composite sample will consist of 30 surface soil aliquots. As shown on Figure B-5, as long as safe conditions exist on both sides of track, half of the 30 aliquots will be collected on each side of track. Where safe conditions only exist on one side of tracks, the aliquots initially intended for the unsafe side of tracks will be collected on the safe side of tracks so that 30 aliquots (total) are still collected for the 1,000-linear-foot sample interval. The intended sampling depth is 0 to 6 inches bgs, which is representative of the maximum depth of soil disturbance associated with typical railroad maintenance activities. If a depth of 6 inches cannot be attained, given the varying levels of compaction in access roads, etc., the maximum depth attainable will be documented in field notes.

The portion of railroad ROW where sampling will be conducted is between toe of ballast and edge of the ROW, which varies from approximately 25 feet from track centerline to more than 100 feet from track centerline, where safe sampling conditions exist. The ground surface may consist of constructed and unimproved access roads, vegetation, bedrock, and areas with exposed soil.

5.2 VV Documentation

Areas of VV may be present within the sampling area. Field team personnel will be trained to continuously inspect both sides of the track for occurrences of VV. Observed areas of VV and other pertinent information will be documented by field team personnel including locations

where VV is observed (including approximate railroad MP), estimated dimensions, estimated and visual estimation of VV density and locations in the field notes, and GPS coordinates for the approximate center of the observed VV. Observed VV occurrences will be segregated to avoid potential high biasing of sub-composite samples and sampled separately later as described below.

The VV information will be relayed back to the TL so a VV sampling task can be scheduled. See Appendix B - *Operable Unit 6, Sampling of Surface Soils Containing Visible Vermiculite* for the delineation and sampling procedures for VV.

6.0 Sample Collection Procedures

Don the appropriate PPE as specified in the governing health and safety plan and/or governing document referencing this procedure. A new pair of disposable gloves will be worn for each aliquot collected. To reduce dust generation during sampling, use a sprayer with de-mineralized water to wet each aliquot location prior to collection.

Per Section 5.0, 30 aliquots will be collected per composite sample and each sampling team will collect 15 aliquots from each side of the track. Aliquot locations, on each side of the track will be staggered to produce a uniform collection of aliquots through the 1,000-foot interval. The aliquots will be spaced approximately every 60 to 65 feet on either side of the track. Aliquots will progressively move from the toe of ballast, towards the field side (outside), to the edge of the BNSF ROW. The first aliquot (on each side) will be collected at the toe of ballast, the second will be collected approximately halfway between the toe of ballast and the edge of the ROW and the third aliquot will be collected near the ROW boundary. The sequence will be repeated by both sampling teams throughout the 1,000-foot sample interval.

If a rail siding is present, the aliquot location will be to the field side (outside) of both tracks. In areas where more than two tracks are present (i.e., siding or yard), the aliquot location will be the first observed occurrence of soil away from the edge of ballast, when the sampler is moving perpendicularly away from the mainline. See Figure B-5 for conceptual sample collection plan.

Clean the aliquot locations of twigs, leaves, other vegetative material that can be easily removed by hand, or materials greater than ¾ inch in diameter. Using the push probe, excavate a hole in the soil approximately ¾ inch to 1 inch in diameter and a maximum of 6 inches deep. Place the material into a 1-gallon sized zip-top plastic bag. Repeat this step for each subsequent aliquot until 30 aliquots have been collected. When complete, each composite sample should be one quarter to one half full and contain approximately 500 grams to 1,000 grams of soil. Composite samples will be homogenized in the field prior to submittal to CDM Smith and the Troy Preparation Laboratory (operated by TechLaw). Homogenization will be completed by thoroughly hand-mixing the completed composite sample within the closed zip-top bag.

Each composite sample will be assigned a unique Sample ID as described in Section B.3.1.2 of the QAPP. Affix the pre-printed sample ID label to the inside of the bag and write the composite sample ID number on the outside of the bag, or affix an additional label using clear packing tape. The composite sample ID number format will be specified in the governing document referencing this procedure. Double bag the sample and repeat the labeling process for the outer bag. Completed composite samples, will be stored in either a new plastic 5-gallon pails or a cooler until custody is transferred.

Decontaminate reusable sampling equipment between composite samples (not between individual aliquots) as discussed in Section 7.2 below.

Repeat steps outlined above until all samples from a property have been collected. Refer to Section 8.2 for field quality control (QC) sample requirements.

7.0 Associated Procedures

7.1 Field Documentation

Field documentation for samples collected using this procedure will follow the current versions of CDM-LIBBY-03 (Completion of Field Sample Data Sheets) and EPA-LIBBY-2012-01 (Field Logbook Content and Control) unless otherwise specified in the governing document referencing this procedure.

7.2 Field Equipment Decontamination

All reusable sampling equipment must be decontaminated between composite samples in accordance with EPA-LIBBY-2012-04 (Field Equipment Decontamination) unless otherwise specified in the governing document referencing this procedure.

7.3 Investigation-Derived Waste (IDW)

IDW will be managed as described in EPA-LIBBY-2012-05 (Handling IDW) and any other applicable governing documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas are sampled, refilling the soil plug is not necessary. Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Spent wipes, gloves, and PPE must be disposed of or stored properly as IDW in accordance with EPA-LIBBY-2012-05 (Handling IDW) unless otherwise specified in the governing document referencing this procedure.

7.4 Sample Custody, Packaging, and Shipping

Sample custody requirements for samples collected using this procedure will follow the current version of EPA-LIBBY-2012-06 (Sample Custody), unless otherwise specified in the governing document referencing this procedure.

As may be applicable, sample packaging and shipping will follow the procedures outlined in EPA-LIBBY-2012-07, unless otherwise specified in the governing document referencing this procedure.

8.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this procedure will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this procedure.

8.1 Training

Every effort will be made to ensure consistency in collecting surface soil samples in support of the Libby Site. Consistency will be achieved to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this procedure noted by the TL will require re-training of field team members.

Field team members will have BNSF- and Libby-specific training including:

- BNSF Contractor Safety Orientation
- Roadway Worker Protection
- ERailSafe Certification
- Asbestos Awareness
- Visible Vermiculite.

8.2 Field Quality Control Samples

Soil field duplicate composite samples will be collected at the rate specified in the governing document referencing this procedure. Field duplicate samples will be collected as co-located soil samples; therefore, the field duplicate composite sample will consist of the same number of aliquots as the parent composite sample. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing document referencing this procedure. These samples will be used to determine the variability of sample results in OU6, but will not be used to determine variability in sampling technique.

APPENDIX B

Operable Unit 6

Sampling of Surface Soil Containing Visible Vermiculite

Revision 0

Prepared By: _____ Date: 11 August 2016
Kennedy/Jenks Consultants

Reviewed By: _____ Date: 11 August 2016
BNSF Railway Company

Reviewed By: _____ Date: _____
CDM Smith Technical Reviewer

Reviewed By: _____ Date: _____
CDM Smith Quality Assurance Reviewer

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for the collection of surface soil samples containing visible vermiculite (VV) by BNSF Railway Company (BNSF) or its contractors related to sampling efforts conducted at the Libby Asbestos Superfund Site Operable Unit 6 (OU6). The composite surface soil samples are screening investigation samples to be collected if VV is observed during OU6 confirmation sampling activities. OU6 confirmation sampling activities will be occurring within BNSF's right-of-way (ROW) and at two properties (i.e. non-operated by BNSF) located within OU6 to test for presence of Libby Amphibole (LA).

The BNSF ROW confirmation sampling SOP is provided in Appendix B of this QAPP (Operable Unit 6 Right-of-Way Confirmation Sampling, 30-Point Composite Sampling of Surface Soil for Asbestos). BNSF ROW confirmation sampling is to be conducted located between the following approximate sets of BNSF mile posts (MPs)[1]:

- MP 1301 (eastern edge of OU6) to MP 1312 (eastern edge of "Investigation Complete" area)
- MP 1320 (western edge of "Investigation Complete" area) to MP 1336.33 (eastern end of Troy Tunnel)
- MP 1336.58 (western edge of Troy Tunnel) to MP 1342 (western edge of OU6).

Surface soil sampling will also be conducted at two non-operating properties consisting of the ground surface above the Troy tunnel (within the ROW boundaries) and the area adjacent to the Libby Amtrak Depot. Soil sampling procedures to be utilized for areas without VV at the two non-operating properties are described in CDM-LIBBY-05 Revision 5, provided in Appendix B of this QAPP.

[1] As shown on Figure B-3 of the QAPP, the investigation at the Libby Railyard is designated as complete.

APPENDIX B

Operable Unit 6

Sampling of Surface Soil Containing Visible Vermiculite

Revision 0

This procedure describes the equipment and procedures to be used for sampling surface soil for the analysis of LA at locations with VV. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Definitions

Composite sampling – A sampling approach in which multiple sample points (or aliquots) are compiled together and submitted for analysis as a single sample.

Field sample data sheet (FSDS) – The controlled (i.e., pre-numbered and tracked) hard copy form on which sample and location information, and any VV observations, are recorded.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the United States Environmental Protection Agency's (EPA's) designated operable units (OUs), as illustrated on the current version of the OU boundary map.

Milepost (MP) – Signs installed by BNSF at approximate mile intervals to reference locations along the tracks. The distance between mileposts varies significantly and is infrequently exactly 5,280 feet in length.

Operable Unit 6 (OU6) – The portion of the Libby Site owned and operated by BNSF. OU6 enters the eastern side of the Libby Site at approximately MP 1301 and leaves the western side of the Libby Site at approximately MP 1342.

Surface soil – Soil located between the ground surface and a maximum depth of 6 inches below ground surface (bgs).

Visible vermiculite – Exfoliated and/or un-exfoliated vermiculite, amphibole asbestiform minerals, and mine tailings present in soils, herein collectively referred to as visible vermiculite (VV).

3.0 Responsibilities

Successful execution of this procedure requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff responsible for collecting surface soil samples using this procedure will understand and implement the requirements contained herein, as well as any additional requirements stated in governing documents referencing this procedure.

Team Leader (TL) – The TL is responsible for overseeing the sample collection process outlined in this procedure, and for checking and verifying the work performed satisfies the objectives of the governing document referencing this procedure. The TL will communicate with the field team members regarding specific collection objectives, and will communicate the need for any deviations from this procedure with the appropriate client personnel, and document the deviations using a Libby Field Record of Modification Form, as provided in the governing document referencing this procedure.

Field Team Members – Field team members performing the sampling described in this procedure are responsible for adhering to the tasks specified herein. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of soil aliquots, within the boundaries outlined by the TL.

4.0 Equipment

The following equipment will be used during implementation of this procedure:

- Global Positioning System (GPS) – Used to (1) verify approximate railroad ROW boundaries, (2) delineate extent of VV area and determine dimensions (in square feet) to determine sampling approach (see Section 5.0), (3) record soil sample point/aliquot locations and, (4) record approximate central point of each composite sample area to represent composite sample GPS location.

- Pin flags – Used (as-needed) to identify soil aliquot locations within each composite sampling area for staff's visual tracking; sample locations will be recorded with the GPS.

- Digital camera – Used to provide photographic documentation of site conditions at time of sampling and delineation.

- Trowel or push probe.

- Shovel.

- Gallon, or larger sized plastic zip-top bags – Used to homogenize sub-composite samples following collection.

- Plastic 5-gallon pails with lids or cooler – composite soil sample will be stored and transported in a closed pail or cooler until relinquished.

- Personal protective equipment (PPE) – For personal protection and to prevent cross-contamination of samples (e.g., disposable, powder less plastic or latex gloves).

- Photoionization Detector (PID) – For personal protection to screen air quality where applicable (e.g., railroad tunnel).

- Field sprayers – Used to suppress dust during sample collection and to decontaminate non-disposable sampling equipment between composite samples.

- De-mineralized water – Used in field sprayers to suppress dust at soil aliquot locations and to clean and decontaminate sampling equipment.

- Plastic bristle brush – Used to clean and decontaminate sampling equipment.

- Alconox - Used to clean and decontaminate sampling equipment weekly.

- Paper towels – Used to dry decontaminated sampling equipment.

- 6-mil poly bag – Used to store and dispose of investigation-derived waste (IDW).

- Trash bag – Used to store and dispose of general trash.

- Indelible ink pen (blue or black ink only).

- Field logbook – Used to record progress of sampling effort and record any problems and field observations.
- Blank FSDSs.
- Sample identification (ID) labels – Pre-printed self-adhesive stickers used to label sample containers and on field documentation (e.g., FSDSs).
- Cooler or other rigid container – Used to store samples while in the field.
- Custody Seals – Self-adhesive seals applied to an individual sample or sample container to demonstrate that sample integrity has not been compromised during sample transfer.

5.0 Sampling Approach

Land use area, sample depth increments, and sampling method protocols by extent of VV for the BNSF ROW, area above Troy Tunnel, and area adjacent to the Libby Amtrak Depot are summarized in the following table:

TABLE 5.1. VISIBLE VERMICULITE SCREENING INVESTIGATION SAMPLING APPROACH

Area	Land Use Area	Sampling Depth Increment (inches bgs) [(a)]	Composite Surface Soil Sampling Protocol (Max VV Area per Sample) [(c)]	Discrete Surface Soil Sampling Protocol (Max VV Area per Sample) [(d)]
BNSF ROW	Limited Use Area	0 – 6 [(b)]	5 acres (217,800 ft^2)	$\leq$500 ft^2
Troy Tunnel (Forested Areas)	Non-Use Area	Not Sampled	Not Sampled	Not Sampled
Troy Tunnel (Landfill Area)	Specific Use Area	0 - 6	1 acre (43,560 ft^2)	$\leq$500 ft^2
Libby Amtrak Depot (Unpaved Parking Lot/Drive Aisles)	Limited/Specific Use Area	0 - 6	1 acre (43,560 ft^2)	$\leq$500 ft^2
Libby Amtrak Depot (Park)	Common Use Area	0 - 6	1 acre (43,560 ft^2)	$\leq$500 ft^2

Notes:

bgs = below ground surface

VV = visible vermiculite

ft^2 = square feet

(a) Unless otherwise noted, sampling depth increment per area type from CDM-LIBBY-06 Revision 2, provided in Appendix B of this QAPP.

(b) The depth increment for the BNSF ROW is 0 – 6 inches bgs based on anticipated activities that may occur within the rail corridor of BNSF ROW.

(c) Soil sampling protocols from Table B-3 "Visual Inspection and Soil Sampling Protocol" of the *General Property Investigation, Quality Assurance Project Plan, Libby Asbestos Site, Operable Units 4 and 7, Libby, Montana, Revision 7*, prepared by U.S. Army Corps of Engineers and CDM Smith for U.S. EPA, dated 11 April 2016.

(d) As discussed and supported by EPA (Zinner, D., EPA, 24 June 2016), discrete samples are proposed when the extent of VV is less than or equal to 500 square feet.

If the extent of VV less than or equal to 500 square feet at any of the land use areas, a discrete sample will be collected at the land use area-specific sampling depth increment.

APPENDIX B

Operable Unit 6

Sampling of Surface Soil Containing Visible Vermiculite

Revision 0

One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations within the BNSF ROW Confirmation Sampling Area where VV is present over an area greater than 500 square feet and up to 217,800 square feet. One additional 30-point composite surface soil sample will be collected for each additional 217,800 square feet of VV.

According to the definitions in CDM-Libby-05, Revision 5, *Site-specific Procedure, 30-point Composite Sampling of Surface Soil for Asbestos*, the contiguous forested areas above the Troy Tunnel and within the BNSF ROW are considered to be Non-Use Areas. According to CDM-Libby-05, Revision 5, Non-Use Areas are to be identified, but not sampled since they are not considered to have a completed exposure pathway.

One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations in the landfill area above the Troy Tunnel and within the BNSF ROW where VV is present over an area greater than 500 square feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected for each additional 43,560 square feet of VV.

One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations within unpaved parking lot/drive aisles of the Libby Amtrak Depot within the BNSF property boundary where VV is present over an area greater than 500 square feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected, as necessary, for each additional 43,560 square feet of VV.

One 30-point composite surface soil sample will be collected between 0 and 6 inches bgs at locations adjacent to the Libby Amtrak Depot and within the BNSF property boundary where VV is present over an area greater than 500 square feet and up to 43,560 square feet. One additional 30-point composite surface soil sample will be collected, as necessary, for each additional 43,560 square feet of VV.

6.0 Sample Collection Procedures

Don the appropriate PPE as specified in the governing health and safety plan and/or governing document referencing this procedure. A new pair of disposable gloves will be worn for each sample collected. To reduce dust generation during sampling, use a sprayer with de-mineralized water to wet each aliquot location prior to collection.

Per Section 5.0, depending on the extent of VV at a given land use area, a discrete sample or a 30-point composite sample is to be collected. Individual aliquot locations will be made at the sampler's discretion, but will be representative of variations in surface cover within, and distributed uniformly throughout the area of VV. Sample depth increments are land use area-dependent and are presented in Table 5.1. Additional sampling collection procedures are broken down by discrete samples and composites samples in the following two subsections.

6.1 Discrete Samples

Discrete samples will be collected at the approximate center of the VV location. The sample location will be cleared of twigs, leaves, and other vegetative material that can be easily removed by hand and any materials greater than ¾-inch in diameter. Using the trowel, or push probe, excavate a hole in the soil to the use-dependent depth increment and collect 500 grams

(minimum) to 1,000 grams (maximum) of soil for submittal to the Troy Preparation Laboratory (operated by Tech Law).

Each discrete sample will be assigned a unique Sample ID as described in Section B.3.1.2. Affix the pre-printed sample ID label to the inside of the bag and write the sample ID number on the outside of the bag, or affix an additional label using clear packing tape. The sample ID number format will be specified in the governing document referencing this procedure. Double bag the sample and repeat the labeling process for the outer bag and indicate if the sample if from the BNSF ROW, area above Troy Tunnel, or Libby Amtrak Depot on the FSDS and in the field notebook.

Decontaminate reusable sampling equipment between composite samples (not between individual aliquots) as discussed in Section 7.2 below.

Repeat steps outlined above until all samples from a property have been collected. Refer to Section 8.2 for field quality control (QC) sample requirements.

6.2 30-Point Composite Samples

The 30-point will be collected uniformly (to extent practical) throughout VV location. Clean the aliquot/sample point locations of twigs, leaves, and other vegetative material that can be easily removed by hand. Using the trowel or push probe, excavate a hole in the soil approximately ¾ inch to 1 inch in diameter. Place the material into a 1-gallon sized zip-top plastic bag. Repeat this step for each subsequent aliquot until 30 aliquots have been collected. When complete, each composite sample should be one quarter to one half full and containing a minimum of 500 grams and up to 1,000 grams of soil. Composite samples will be homogenized by hand in a closed zip-lock bag prior to submittal to the Troy Preparation Laboratory (operated by TechLaw).

Each composite sample will be assigned a unique Sample ID as described in Section B.3.1.2. Affix the pre-printed sample ID label to the inside of the bag and write the composite sample ID number on the outside of the bag, or affix an additional label using clear packing tape. The composite sample ID number format will be specified in the governing document referencing this procedure. Double bag the sample and repeat the labeling process for the outer bag. Indicate if the sample if from the BNSF ROW, area above Troy Tunnel, or Libby Amtrak Depot on the FSDS and in the field notebook.

Decontaminate reusable sampling equipment between composite samples (not between individual aliquots) as discussed in Section 7.2 below.

Repeat steps outlined above until all samples from a property have been collected. Refer to Section 8.2 for field QC sample requirements.

7.0 Associated Procedures

7.1 Field Documentation

Field documentation for samples collected using this procedure will follow the current versions of CDM-LIBBY-03 (Completion of Field Sample Data Sheets) and EPA-LIBBY-2012-01 (Field

Logbook Content and Control) unless otherwise specified in the governing document referencing this procedure.

7.2 Field Equipment Decontamination

All reusable sampling equipment must be decontaminated between composite samples in accordance with EPA-LIBBY-2012-04 (Field Equipment Decontamination) unless otherwise specified in the governing document referencing this procedure.

7.3 Investigation-Derived Waste (IDW)

IDW will be managed as described in EPA-LIBBY-2012-05 (Handling IDW) and any other applicable governing documents. In general, replace the soil plug with excess sample volume. The soil should be placed back into the hole and tamped down lightly. If sandy areas are sampled, refilling the soil plug is not necessary. Rinse water, the roots of vegetation removed during sampling, and any excess soil volume may be returned to the sampled area.

Spent wipes, gloves, and PPE must be disposed of or stored properly as IDW in accordance with EPA-LIBBY-2012-05 (Handling IDW) unless otherwise specified in the governing document referencing this procedure.

7.4 Sample Custody, Packaging, and Shipping

Sample custody requirements for samples collected using this procedure will follow the current version of EPA-LIBBY-2012-06 (Sample Custody), unless otherwise specified in the governing document referencing this procedure.

As may be applicable, sample packaging and shipping will follow the procedures outlined in EPA-LIBBY-2012-07, unless otherwise specified in the governing document referencing this procedure.

8.0 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) for activities described in this procedure will be attained through a variety of processes, including, at a minimum, the items discussed below. Additional QA/QC requirements, such as audits or field assessments, will be addressed in the governing document referencing this procedure.

8.1 Training

Every effort will be made to ensure consistency in collecting surface soil samples in support of the Libby Site. Consistency will be achieved to the extent possible through proper training, using designated field staff, and providing TL oversight. Any deficiencies or inconsistencies in implementing this procedure noted by the TL will require re-training of field team members.

Field team members will have BNSF- and Libby-specific training including:

- BNSF Contractor Safety Orientation
- Roadway Worker Protection

- ERailSafe Certification
- Asbestos Awareness
- Visible Vermiculite.

8.2 Field Quality Control Samples

Soil field duplicate composite samples will be collected at the rate specified in the governing document referencing this procedure. Field duplicate samples will be collected as co-located soil samples; therefore, the field duplicate composite sample will consist of the same number of aliquots as the parent composite sample. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing document referencing this procedure. These samples will be used to determine the variability of sample results in OU6, but will not be used to determine variability in sampling technique.

Libby Asbestos Superfund Site
Site-specific Procedure for
Location Coordinate Data

Prepared by: Diane M Rode Date: 3/29/16
CDM Smith

Reviewed by: Date: 3/29/16
CDM Smith Technical Reviewer

Reviewed by: Date: 3/29/16
CDM Smith Quality Assurance Reviewer

Revision No.	Date	Reason for Revision
0	5/21/07	--
1	--	Not finalized/approved
2	7/27/09	Updated to align processes with current GPS collection equipment, and data management processes, and requirements
3	4/24/12	Updated to align processes with current GPS collection equipment, and data management processes, and requirements
4	8/14/13	Updated to align processes with current GPS collection equipment, and data management processes, and requirements
5	3/24/14	Updated to align processes with current location coordinate sourcing from geo-referenced surveys
6	3/23/16	General administrative updates; added details for digitization process

1.0 Objective

The objective of this site-specific procedure is to establish baseline requirements, procedures, and responsibilities for managing location coordinate data by the U.S. Environmental Protection Agency (EPA) or its contractors related to investigations and response actions conducted at the Libby Asbestos Superfund Site (Libby Site). Location coordinate data is generated by global positioning system (GPS) units or digitization – this procedure addresses both collection techniques and the post-collection steps. Additions or modifications to this procedure may be detailed in governing documents referencing this procedure.

2.0 Background

2.1 Definitions

Field sample data sheet (FSDS) – The hard copy form on which sample and location information is recorded.

Libby Asbestos Superfund Site (Libby Site) – All buildings and land within the boundaries of the EPA's designated operable units (OUs), as illustrated on the most recent version of the OU boundary map.

Libby_YYMMDD.ddf Data Dictionary (Libby data dictionary) – The filename for the Libby data dictionary contains the date of the latest revision in the format YYMMDD. All Trimble® handheld units used by CDM Smith at the Libby Site should be pre-loaded with a generic data dictionary that handles collection of lines, points, and areas. In addition, the Trimble® units will be uploaded with the Libby data dictionary by the Onsite Data Manager (or designee).

Scribe – An EPA data management system used to manage location, sample, and analytical data.

2.2 Discussion

The Libby data dictionary is set up to meet the location coordinate requirements discussed in Appendix A of the *EPA Data Management Plan, Libby Asbestos Superfund Site* (EPA 2015). For all locations assigned by CDM Smith during investigation and response action activities, a latitude and longitude coordinate representing the location will be collected; additional specifics for coordinate collection will be included in the governing document referencing this procedure. All personnel required to collect GPS data will be familiar with the contents of the Libby data dictionary.

Table 1 specifies the attributes required to be collected for each feature type when a GPS point is collected.

Table 1. Attributes Collected in the Libby_YYMMDD Data Dictionary

Feature	Attributes Collected
Any Location	LocationID
BD Location	LocationID
SP Location	LocationID
XX Location	LocationID

These features are discussed in detail in Section 4.0 of this document. Instructions for loading a data dictionary onto a datalogger are discussed in Section 4.3.

The Libby data dictionary does not apply to digitized location coordinates. The digitization process is discussed in Section 5.6.

3.0 Responsibilities

Team Leader (TL) – The TL is responsible for overseeing the GPS point collection process for their field teams, ensuring field team members are adequately trained and coordinating with the Onsite Data Manager to ensure location coordinate requirements are met (as specified in the governing document referencing this procedure).

Field team members – Field team members are responsible for collecting GPS data, as specified in the governing document referencing this procedure, and reporting any data collection issues to the TL. For readability, field team members are also referred to as Trimble® unit "operators" throughout this procedure.

Drafting team – This staff is responsible for digitizing location coordinates and providing files to the Onsite Data Manager for upload to Scribe.

Onsite Data Manager – The Onsite Data Manager is responsible for coordinating resources (e.g., drafting team, GIS Specialist) to ensure the overall EPA data reporting requirements for location coordinate data are met. The Onsite Data Manager will coordinate the post-processing of GPS points collected by field team members, and work with the TL to ensure the location coordinate dataset for each field activity is complete. The Onsite Data Manager will also facilitate digitization efforts, and is responsible for publishing all finalized location coordinate data to Scribe.net.

GIS Specialist – The GIS Specialist is responsible for maintaining the Libby Project GIS layer for CDM Smith staff use, and, at the discretion and direction of the Onsite Data Manager, digitizing location coordinates and providing those files to the Onsite Data Manager for upload to Scribe.

4.0 Equipment, Software, and Configuration

Software can vary with rental equipment; however, the preferred software for transfer and processing of GPS data is GPS Pathfinder Office and TerraSync. **Table 2** contains guidelines for configuration settings (based on TSC1 5.27 software) that should be implemented for GPS point collection. Configuration settings for TerraSync are outlined immediately following Table 2. Note that some GPS Pathfinder Office and TerraSync settings can be changed to accommodate data collection needs.

Table 2. Configuration Settings for Trimble® ProXRS

GPS Rover Options - Logging Options		
Logging Intervals	Point feature	1 s
	Line / area	3 s
	Not in feature	none
	Velocity	none
Confirm end feature	no	
Minimum Positions	30	
Carrier phase	Carrier mode	off
	Minimum time	10mins
GPS Rover Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	6.0	
DOP type	PDOP	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Rover Options – Real-time input		
Preferred correction source	use uncorrected GPS	
GPS Rover Options – General real-time settings		
Correction age limit	10s	
GPS Rover Options – Antenna options		
Height	Set according to model	
Measure	Vertical	
Confirm	Never	
Type	auto-filled when part number is entered	
Part number	get part number off of antenna	
GPS Rover Options – Initial Position		
North	USft	
East	USft	
GPS Rover Options – 2D altitude		

Altitude(MSL)	USft	
Computed at	time	
Computed at	date	
GPS Base Station Options – Logging Options		
Logging Intervals	Measurements	5s
	Positions	30s
Audible Click	Yes	
Log DOP data	Yes	
GPS Base Station Options – Position Filters		
Position mode	Manual 3D	
Elevation mask	15 degrees	
SNR mask	4.0	
PDOP mask	6.0	
PDOP switch	4.0	
GPS Base Station Options – Real-time output options		
Real-time output mode	off	
Radio type	Custom	
Baud rate	9600	
Data bits	8	
Stop bits	1	
Parity	Odd	
RTCM options	Station	1
	Message type	Type 1
	Message interval	5s
	Message suffix	None
	CTS flow control	Off
	CTS xmit delay	0ms
	RTS mode	High
	RTS edge delay	0ms
GPS Base Station Options – Reference position		
Datum	WSG 1984	
Zone	11 North	
NMEA/TSIP Output options		
Output	TSIP	
Baud rate	38400	
Coordinate System	Latitude/Longitude	
Map display options	All show with no background	
Units and Display		
Units	Distance(2D)	US Survey Ft
	Area	Square feet
	Velocity	Miles/Hour
	Angle format	DD.dddd
	Order	North/East
	North reference	True
	Magnetic declination	Auto
	Null string	
	Language	English
Time and Date	24 hour clock	Yes
	Time	##:##:##
	Date format	MM/DD/YYYY
	Date	MM/DD/YY weekday
Quickmarks	Attributes	Repeat
	Confirm	No

TerraSync (v4.15) Setup

The following configuration settings should be employed:

Logging Settings: Antenna Height

GPS Settings: PDOP Settings are determined on basis of Productivity versus Precision. Slide the bar to obtain the highest precision for a given location. It is recommended that the PDOP should be below 4 prior to collection.

Real-time Settings: Use Uncorrected GPS

Coordinate System Settings: Coordinate System: Latitude/Longitude; Datum: WGS84

Units: Distance Units: US Survey Feet; Area Units: Square Feet; Angle Units: Degrees; Lat/Long Format: DD.dddd; Offset Format: Horizontal/Vertical; North Reference: True; Magnetic Declination: Auto(15.2°E)

External Sensors: None

5.0 Procedures

The following sections describe GPS point collection and handling for features commonly used at the Libby Site. Digitized location coordinate procedures are also discussed.

5.1 Selecting Locations

All features collected at the Libby Site are point features. Any location feature will allow the entry of any 9-digit text value, which will correspond to the Location ID assigned on the field sample data sheet (FSDS). For ease and accuracy of data entry of location values, three additional location features are available for which the Location ID attribute defaults to the values "BD-", "SP-", or "XX-" accordingly. The prefix code values are specific to the field event and defined in the governing document referencing this procedure. Digitized point locations follow the selection protocol below with the exception of buildings which use the approximate center.

Building Locations

For building locations, a GPS point is collected near the front door or main entrance of the building. Refer to the governing document for details regarding building location types.

Locations Where No Sample is Collected

For investigation locations where a sample is not collected, a GPS point is collected at the approximate center of each location area, or as specified in the governing document referencing this procedure.

Soil Sample Locations

For grab sample locations, a GPS point is collected at the exact sampling location.

For composite sample locations, a GPS point is collected at the approximate center of the sample area. In the case of an irregular-shaped sample area or sample area that is non-continuous (e.g., a flowerbed that wraps around a house), a GPS point is collected at the center of the largest continuous sample area.

A GPS point is collected once per unique sample location. All subsequent samples taken at that location (including field duplicate samples) will use the previously assigned Location ID and corresponding coordinates.

Pre-determined Sample Areas

For pre-determined sample (e.g., gridded) areas where waypoints are available, the Trimble® units may be pre-loaded with waypoint files to guide samplers to sampling locations. Pre-loading of coordinates is typically performed by the Onsite Data Manager. It should be noted that, in order to ensure GPS coordinate data are included in the project database, *GPS points will also be collected at the time of sampling for sample locations located using waypoint files.*

Outdoor Stationary Air Sample Locations

For permanent outdoor stationary air sample locations (i.e., those representing a consistent monitoring zone or area, and are collected on a routine schedule), a GPS point is collected once per unique sample location. All subsequent samples taken at that location use the previously assigned Location ID and corresponding coordinates.

Interest Point, Interest Area

GPS points for interest point and interest area features are not routinely collected at the Libby Site. However, they are included in the Libby data dictionary in the event that a GPS point or a series of points is collected to document the perimeter of an interest area or sample area or other point that does not correspond to a location in the Scribe database.

Features Not Requiring Location Coordinates

GPS points are not collected for the following features, unless otherwise specified in the governing document referencing this procedure:

- Stationary air and soil samples collected inside or beneath buildings (these locations are associated with the coordinates of the building where the sample was collected)
- Soil samples taken at depth from the same sample area as a previously collected sample (the at-depth soil sample will be assigned the same Location ID as the shallower sample in order to relate both samples to the same coordinates)
- Duplicate or split soil samples (which are assigned the same Location ID and coordinates as the parent sample)
- Outdoor Stationary air samples, with the exception of permanent monitoring locations, as designated in site-specific work plans
- Duplicate or replicate air samples (which are assigned the same Location ID and coordinates as the parent sample)
- Personal air samples (locations are associated with the coordinates of the building (i.e., BD Location ID) or property (i.e., AD Location ID) where the sample was collected)
- Bulk samples collected from building material

5.2 Operation of GPS Handheld Units

GPS points at the Libby Site will be collected using Trimble® GPS handheld units, or equivalent equipment that meets the EPA's accuracy standards for geospatial data. Operators must be standing at the sample location before the unit starts to collect positions. Once the unit has started collecting positions, the operator must remain standing at the sample location until the minimum required positions have been collected. A minimum of 30 positions will be collected for each GPS location point. More positions may be required in circumstances where the GPS collection parameters are excessive due to poor satellite position. GPS target parameters should be consistent with those listed in **Table 2** (Configuration Settings for Trimble® ProXRS). These parameters should be emulated as closely as possible if using other GPS unit models.

Accuracy Criteria

Due to GPS unit availability from third-party vendors, various Trimble® models may be used at the Libby Site. However, it is imperative the model's performance rating not exceed accuracy exceptions greater than 5 meters, in order to comply with EPA Policy CIO 2131.0 *National Geospatial Data Policy, Tier 2* standards (EPA 2005). EPA verification of these standards is built into post-processing logarithms. Data verification in the upload process will check for a horizontal precision of less than 5 meters and that a minimum of 30 positions were compiled for each point (see Section 6.0 for more detail).

Record-keeping Requirements

Serial numbers of the Trimble® datalogger, receiver, and antenna or beacon will be recorded in a field logbook. GPS filenames will be recorded in the logbook. Recording GPS filenames on FSDSs is not required.

Upgrades to GPS Equipment and Software

GPS unit equipment and software is subject to change according to availability. The TL (or designee) is responsible for contacting the technical support of the vendor if there are any questions regarding setup, operation, or data transfer of models not previously used at the Libby Site.

5.3 GPS Data Transfer from Handheld Units to Lbysvr1

Most Trimble® units connect to a personal computer (PC) through the charger unit using a universal serial bus (USB) cable (type A to type B), and Microsoft Active Sync software. Note that there are Active Sync connection settings to enable or disable once the device is connected to the PC: from the Active Sync menu, select Tools, select Options. These connect the Trimble® to other Windows applications on the PC (e.g., email, task managers, etc.). The main reason to disable these settings at the CDM Smith Libby project office is that the Trimble® units are shared and therefore activation is not needed.

1. Turn on the Trimble® unit
2. Open Terrasync
3. Select Data
4. At the bottom of list, select File Manager
5. Open Pathfinder
6. Select Utilities

7. Select Data Transfer. The receive tab should be active.
8. From the Device list, select GIS Datalogger on Windows CE
9. Click on the connect icon (the button with the checkmark circled in green). A picture on the right will indicate the connection status.
10. Select Add
11. Select Open (make sure all files are highlighted)
12. Select Transfer All

Note: To load a data dictionary onto the datalogger, from Step 7, select the Send tab. When adding the file, navigate to the file you wish to load onto the datalogger. Make sure the file is highlighted before selecting transfer all.

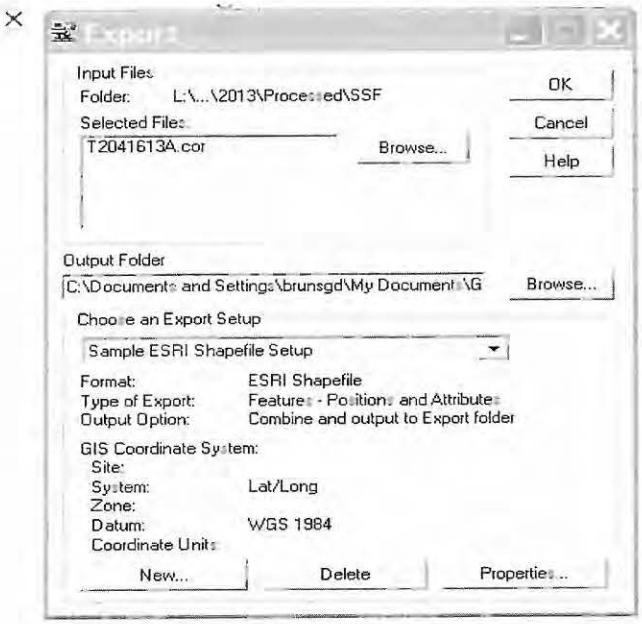
5.4 GPS Data Processing

Following download, the Trimble® files are stored on the CDM Smith Libby project server in the *\\Lbysvr1\Projects\Data Management\Pfdata\Libby* folder. The files, denoted by their .ssf extension, are differentially corrected and coordinate data for each unique location is uploaded to the Scribe location table using the procedures below:

1. Open GPS Pathfinder Office. Establish default folder and differential correction settings as shown in Table 3. Drag the .ssf files of interest to the Pathfinder map window. From the Pathfinder main menu options select Utilities. Select Differential Correction. A .cor file will be generated with a filename that corresponds with the .ssf filename. The .ssf files and the .cor files will be filed within the *\\Lbysvr1\Projects\Data Management\Pfdata\Libby* folder.

2. In order to prepare files for updating Scribe and to produce maps for a quality control (QC) verification of the points, select Utilities from the Pathfinder menu. Select Export. Review the selected file and output folder shown in the Export window. Choose an Export Setup of "Sample ESRI Shapefile Setup" (**Figure 1**).

Figure 1



3. From the Export window select Properties. Under the Coordinate System tab, set Export Coordinates to "XY" and choose a directory for the projection file (.prj) (ideally the same as the output folder established in Step 1). Select OK.

4. Select OK at the top right corner of the Export window. A series of files will be generated in the previously defined output folder (**Figure 2**).

Figure 2

5. Use Arc Catalog to rename the .prj, .dbf, .shp, .shx, and .trx files to include the GPS filename (captured in the .inf file). As an example, XX-Locat.dbf would be renamed to T2041613A-XX.dbf.

6. The renamed files will be temporarily maintained in the *\\Lbysvr1\Projects\Data Management\Pfdata \Libby\2016 (or current year)\Processed\Shapefiles* folder where data is consolidated for updating Scribe.

5.5 GPS Data Transfer to Scribe

7. Open the DataConsolidation MS Access database located in the *\\Lbysvr1\Data Management\Pfdata\Libby\2016 (or current year)\Processed* folder.

8. On the right side of the main window, click on "Files Not Processed." A table will appear showing the .dbf files that have not been uploaded to Scribe. Make a note of these and close the table.

9. Click on Select a File. Select one of the unprocessed files and click on Open. The Select File Location window will disappear.

10. Click on Run Process. Data will be queued for updating location coordinates in the Scribe location table.

11. Repeat steps 10 and 11 until all the unprocessed files are queued. Once this occurs, click on Update Scribe which updates the Scribe location table.

12. To review any location coordinates that have not been successfully updated in Scribe, click "See Points w Issues." Make revisions/corrections to this table as needed and update Scribe as needed.

Table 3. Pathfinder Office Settings

Pathfinder Differential Correction
Processing Type - Automatic Carrier and Code Processing
H-Star Processing - Use a Single Base Provider
○ Correct Settings
▪ Output corrected and uncorrected positions
▪ Smart automatic rover filtering
▪ Re-correct real-time positions
○ Base Data – Bonners Ferry or other nearest
○ Folder Search – set to default
○ Reference Position - Bonners Ferry or other nearest
○ Output folder - set to directory of input file
○ Output filename - Use original filename, overwriting any existing .cor file
Pathfinder Export
Input files - .cor file
Output Folder – set to default
Choose an Export Setup - Sample ESRI Shapefile Setup
Properties
Coordinate System

○ Use Current Display Coordinate System
▪ Export Coordinates As XY
▪ Projection File – set to default
○ ESRI Shapefile
▪ Export Tracking Themes
▪ Track ID Attribute Name
○ Position Filter
▪ GPS Position Info
▪ Minimum Satellites – 2D (3 or more SVs)
▪ Maximum PDOP – Any
▪ Minimum HDOP - Any
○ Include Positions That Are
▪ All options other than Uncorrected
▪ Options other than Filter By Precision (68% confidence)
▪ Include Non-GPS Positions
○ Data
▪ Features – Position and Attributes. Export All Features
▪ Output - Combine all input and output to export folder under Output Files
▪ DOS Files under System File Format
○ Attributes
▪ Attribute Value under Export Menu Attributes As
▪ Generated Attributes, all options for All Feature Types and Point Features
▪ No selections for Line Features or Area Features
○ Units - Use Current Display Units
▪ Distance Units: US Survey Feet
▪ Area Units: Square Feet
▪ Velocity Units: Feet Per Second
○ Decimal Places
▪ Lat/Long: 9
▪ North/East: 3
▪ Precision: 1 Time: 0
▪ All other selections: 3
Pathfinder Options
○ Units
▪ Distance – US Survey Feet
▪ Area – Square Feet
▪ Velocity – Feet per second
▪ Offsets – US Survey Feet
▪ Offset Distance Format: Horizontal and Vertical
▪ Precisions – US Survey Feet
▪ Confidence – 68% Precisions
▪ North Reference: True
○ Coordinate System
▪ Coordinate System and Zone
▪ System – Lat / Long
▪ Datum NAD 83
▪ Altitude Measured: MSL
▪ Altitude Units - Meters

5.6 Digitized Location Coordinates

For situations where GPS points are not collected using a GPS unit (i.e., detailed investigation [DI] portion of the General Property Investigation and exterior soil response actions), location coordinates will be digitized by the drafting team or a GIS Specialist using the property-specific land survey provided by a certified surveyor. The computer-aided design (CAD) drawing is composed by the drafting team using the survey and the coordinates provided in the land survey. The CAD

drawing is geo-referenced with the survey coordinates provided by the surveyor; therefore, these coordinates meet the standard of the survey-grade GPS unit used for survey, which are well within EPA's Tier 2 standards. Afterwards, the desired points are digitized using the DI sketch (for GPIs) or the draft redline drawing (for planned exterior soil removals).

Alternatively, location coordinates can be exported from the GIS Specialist-maintained Libby Project GIS layer for the screening investigation [SI] portion of the General Property Investigation, or to replace missed or corrupt coordinate data. Field documentation of SIs are recorded on a printed map of the aerial image produced from the Libby Project GIS layer. The completed field map documenting all investigation locations is scanned, imported, overlain, and georeferenced back into the same GIS by TL or designee. Single-point Location IDs (see Section 5.1) are recorded and added to the data layer.

Coordinates are digitized in Decimal Degrees (DD.dddd), NAD 83 format. A Microsoft Excel file containing the Location information and corresponding coordinates is maintained on the Libby server or emailed to the Onsite Data Manager who updates to the Scribe location table.

6.0 Quality Assurance/Quality Control (QA/QC)

Post-processed GPS coordinates undergo visual review by the TL. Mapped points are viewed to ensure they represent the expected area at the expected property. The TL uses the shapefile exported in Step 5 in Section 5.4, in a geographic information system (e.g., ArcView), Corrections are coordinated with the Onsite Data Manager (or designee).

Verification involves comparing data attributes against EPA-established accuracy criteria, which is performed by the Onsite Data Manager (or designee) during the "Run" process (Step 11 in Section 5.4). Any point location not within 5 meters of "Horz_Prec" (horizontal precision) or collected using less than 30 positions is flagged in the DataConsolidation MS Access database. Additionally, the following formula is applied to each point to evaluate the point's accuracy: [Horz_Prec] + (1.645 X [Stnd_Dev]) = X , where X must be less than 5 to ensure the point falls within 5 meters of the intended target with 95% confidence. Any point exceeding a 5-meter calculated position is flagged for additional visual review by the TL and rectified as necessary.

7.0 References

EPA. 2005. CIO Policy Transmittal 05-002, *National Geospatial Data Policy*. August 24. [http://www.epa.gov/sites/production/files/2014-08/documents/national_geospatial_data_policy_0.pdf].

EPA. 2015. *EPA Data Management Plan, Libby Asbestos Superfund Site, Version 2015.1*. March 17. [https://team.cdm.com/eRoom/R8-RAC/Libby/Libby Data Management Plan_Final 2015.1.docx].

APPENDIX B

Operable Unit 6

Global Positioning System (GPS) Coordinate Collection and Handling

Addendum to CDM-Libby-09, Revision 5

Revision 0

Prepared By: _____ Date: 11 August 2016
Kennedy/Jenks Consultants

Reviewed By: _____ Date: 11 August 2016
BNSF Railway Company

Reviewed By: _____ Date: _____
CDM Smith Technical Reviewer

Reviewed By: _____ Date: _____
CDM Smith Quality Assurance Reviewer

BNSF Railway Company (BNSF) intends to use a sub-meter global navigation satellite system (GNSS) receiver paired with an Apple iPad tablet (or equivalent) running ArcGIS Collector software for field planning and field data collection activities at Operable Unit 6 (OU6). The GNSS receiver to be used is the EOS Arrow 100 receiver (or equivalent). The iPad/GNSS Receiver with ArcGIS Collector software (collectively herein termed the iPad/ArcGIS setup) would be used as an alternative to a traditional Trimble GPS with TerraSync or GPS Pathfinder Office software.

This document presents an addendum to the following standard operating procedure (SOP) specific to the use of Trimble GPS with TerraSync or GPS Pathfinder Office from the Operable Unit 5 (OU5) quality assurance project plan (QAPP):

> CDM-Libby-09, Revision 5: *Libby Asbestos Superfund Site, Site-Specific Procedure, GPS Coordinate Collection and Handling.*

CDM-Libby-09 includes Section 1.0 through 7.0. Section 1.0 Objective and Section 3.0 Responsibilities are consistent between CDM-Libby-09 and this addendum.

This addendum includes additions to the following sections:

- 2.1 Definitions
- 5.1 Selecting Locations.

This addendum also includes equivalent SOP narrative specific to the iPad/ArcGIS setup for the following sections:

- 2.2 Discussion
- 4.0 Equipment, Software, and Configuration
- 5.0 Procedures (specifically 5.2 through 5.5)
- 6.0 Quality Assurance/Quality Control (QA/QC)

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1.0 Objective

Adopted in-whole from CDM-Libby-09.

2.0 Background

2.1 Definitions

OU6 Libby Collector Map – This is equivalent to the Libby data dictionary. This is where all the base data, in addition to all collected global positioning system (GPS) data, will be loaded to within ArcGIS software. All iPads used at OU6 will be loaded with this map and will be updated throughout the project.

ArcGIS Collector – App that runs on iPad for collecting location data, uploading collected data, and viewing pre-loaded basemaps and collected data. This is the software through which OU6 Libby Collector Map runs.

EOS Tools Pro – App that runs on iPads used to monitor the signal quality and accuracy the EOS Arrow 100 global navigation satellite system (GNSS) receiver is receiving. Also allows user to set alarms to notify the user if accuracy falls below a set level.

Operable Unit 6 (OU6) – The portion of the Libby Site owned and operated by BNSF. OU6 enters the eastern side of the Libby Site at approximately milepost (MP) 1301 and leaves the western side of the Libby Site at approximately MP 1342.

OU6 Rail Corridor Composite Sample – A composite surface soil sample representative of an approximate 1,000-linear-foot portion of the OU6 rail corridor consisting of 30 discrete sample points (aliquots).

2.2 Discussion

Confirmation composite sample locations will have a latitude and longitude coordinate representing the location collected using the iPad/ArcGIS setup. All field personnel will be trained to collect GPS data using the iPad/ArcGIS setup and will be familiar with the contents of the OU6 Libby Collector Map.

3.0 Responsibilities

Adopted in-whole from CDM-Libby-09.

4.0 Equipment, Software, and Configuration

Location coordinate data collection will take place using an iPad running ArcGIS Collector connected to an EOS Arrow 100 GNSS receiver. As discussed, this setup will be an equivalent alternative to the Trimble unit and associated software.

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Operable Unit 6

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Figures 1 and 2 show comparable specifications for an EOS Arrow 100 GNSS receiver (Arrow receiver) and a Trimble GPS meeting the CDM-Libby-09 specifications. The real-time position correction of the Arrow receiver eliminates the need for data post processing, as compared to the post processing steps associated with the Trimble GPS and GPS Pathfinder Office discussed in CDM-Libby-09. Additionally, the iPad's Collector application allows for a single step data upload process from collection to storage of the data on an ArcGIS server.

Figure 1: EOS Arrow 100 GNSS Receiver Specifications

Key Features

- Full GNSS : **GPS/GLONASS/Galileo/BeiDou/QZSS**
- 100% **Android, iOS, Windows** compatible.
- **60cm real-time** accuracy using free SBAS supports
- **Esri®, Terrago** and **other Mobile GIS software**
- **Atlas™ feature H100 service ready**

GPS Sensor

Receiver Type: L1/G1/B1, GPS + GLONASS + BeiDou (Galileo and QZSS optional) with carrier smoothing

Channels: 158-channel, parallel tracking

Number of tracked satellites: 12 GPS (15 when no SBAS), 12 GLONASS, 22 BeiDou, 15 Galileo (future firmware), 15 QZSS (future firmware)

SBAS Support: 3-channel, parallel tracking WAAS, EGNOS, MSAS, GAGAN (SBAS ranging where supported)

Update Rate: 1Hz Default, optional 10Hz and 20Hz

DGNSS Horizontal Accuracy: < 30cm HRMS

SBAS Accuracy: < 60cm 2dRMS, 95% confidence[1] (< 30cm HRMS, < 25cm CEP)

Horizontal Accuracy: < 2.5m 2dRMS, 95% confidence[1] (autonomous, no SA)

Optional Proprietary RTCM: < 20cm 2dRMS, 95% confidence[1]

Optional Single Frequency RTK: 1cm + 1ppm1

Cold Start: < 60 sec typical (no almanac or time)

Reacquisition: < 1sec

Maximum Speed: 1,850 kph / 1,150 mph / 999 knots

Maximum Altitude: 18,288m (60 000 ft)

APPENDIX B

Operable Unit 6

Global Positioning System (GPS) Coordinate Collection and Handling

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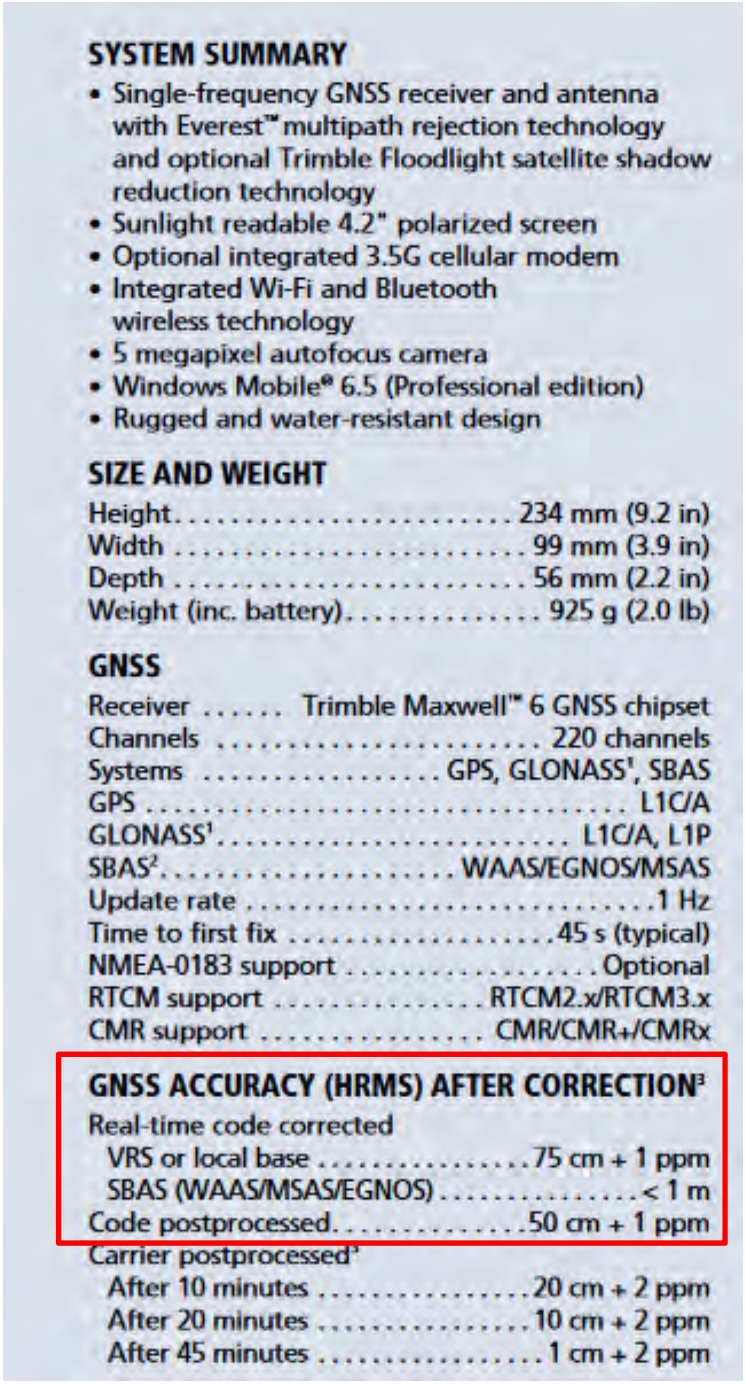
Figure 2: Trimble GPS GeoXT Specifications



SYSTEM SUMMARY

- Single-frequency GNSS receiver and antenna with Everest™ multipath rejection technology and optional Trimble Floodlight satellite shadow reduction technology
- Sunlight readable 4.2" polarized screen
- Optional integrated 3.5G cellular modem
- Integrated Wi-Fi and Bluetooth wireless technology
- 5 megapixel autofocus camera
- Windows Mobile® 6.5 (Professional edition)
- Rugged and water-resistant design

SIZE AND WEIGHT

Height	234 mm (9.2 in)
Width	99 mm (3.9 in)
Depth	56 mm (2.2 in)
Weight (inc. battery)	925 g (2.0 lb)

GNSS

Receiver	Trimble Maxwell™ 6 GNSS chipset
Channels	220 channels
Systems	GPS, GLONASS[1], SBAS
GPS	L1C/A
GLONASS[1]	L1C/A, L1P
SBAS[2]	WAAS/EGNOS/MSAS
Update rate	1 Hz
Time to first fix	45 s (typical)
NMEA-0183 support	Optional
RTCM support	RTCM2.x/RTCM3.x
CMR support	CMR/CMR+/CMRx

GNSS ACCURACY (HRMS) AFTER CORRECTION[3]

Real-time code corrected	
VRS or local base	75 cm + 1 ppm
SBAS (WAAS/MSAS/EGNOS)	< 1 m
Code postprocessed	50 cm + 1 ppm
Carrier postprocessed[3]	
After 10 minutes	20 cm + 2 ppm
After 20 minutes	10 cm + 2 ppm
After 45 minutes	1 cm + 2 ppm

5.0 Procedures

The following sections describe how GPS points are collected and handled for features at OU6.

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Operable Unit 6

Global Positioning System (GPS) Coordinate Collection and Handling

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5.1 Selecting Locations

The majority of features to be collected at OU6 are point features. Any location feature will allow the entry of text or numeric values, which will correspond to the Index ID assigned on the field sample data sheet (FSDS). The prefix code values are specific to the field event and defined in the governing document referencing this procedure.

Thirty-point composite surface soil samples collected every 1,000 linear feet along the BNSF mainline railroad track throughout OU6 will have the composite sample GPS data point collected at the eastern end of the 1,000-linear-foot interval. A GPS data point will be collected for each aliquot that makes up the 30-point composite surface soil sample. Each aliquot location will be identified using the previously assigned composite sample Index ID (Sample ID) plus an aliquot number (one through 30). For example, the Index ID for the 21st aliquot of composite sample #1 would be BG00001-21. Odd aliquot numbers will be assigned to the southern side of the tracks, while even numbers will be assigned to the northern side of the tracks.

OU6 samples collected at other locations (e.g., Libby Amtrak Depot) will have the composite sample GPS data point collected at the approximate center of the sample area consistent with CDM-Libby-09.

The location of areas with visible vermiculite will be documented during right-of-way confirmation sampling. Using the procedures found in CDM-Libby-06 *Semi-Quantitative Visual Estimation of Vermiculite in Soils*, sampling personnel will identify and delineate the horizontal extent of visible vermiculite. The horizontal extent of visible vermiculite will be recorded as a series of point data (forming a polygon) using the iPad/ArcGIS setup. Areas of visible vermiculite will be sampled at a later date. Each area of visible vermiculite will be assigned a temporary identification consisting of the approximate MP, to the nearest 0.1 mile, and the side of the tracks on which visible vermiculite was observed. For example, 1320.1S, would correlate to an area of visible vermiculite observed on the southern side of the tracks at BNSF MP 1320.1.

5.2 Operation of GPS/Tablet Handheld Units

GPS points at OU6 will be collected using iPad tablets connected to an EOS Arrow 100 GNSS receiver unit. Equivalent GNSS receivers or tablets capable of running ArcGIS Collector may be used. Operators must be standing at the sample location before collecting the position data. All operators will be proficient at using the iPad, EOS Arrow 100 GNSS receiver, the ArcGIS Collector app, and the EOS Tools Pro app.

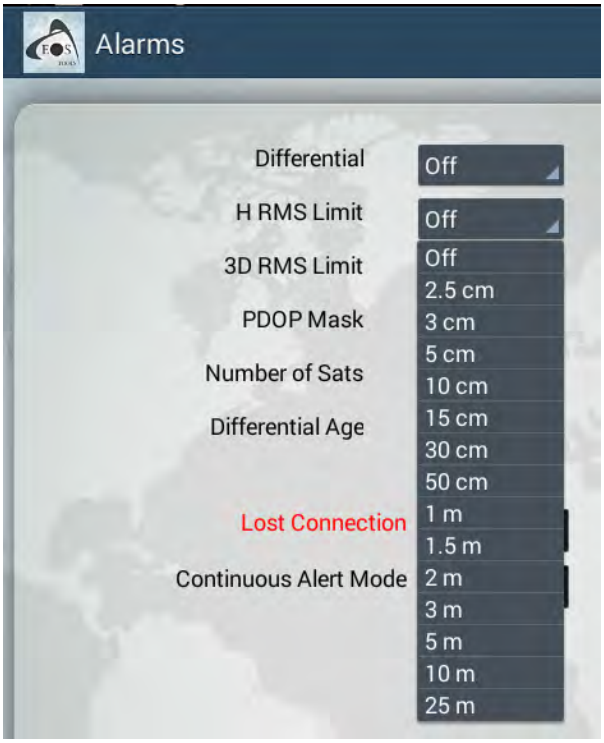
Accuracy Criteria

The EOS Tools Pro app (Figure 3) will be used to continuously monitor GPS signal quality and to verify the horizontal accuracy remains within 5 meters, in order to comply with U.S. Environmental Protection Agency (EPA) Policy CIO 2131.0 National Geospatial Data Policy, Tier 2 standards (EPA 2005). The EOS Tools Pro app provides an H RMS value which is the horizontal position accuracy. Per the manufacturer, multiplying the H RMS value by two yields the 95% confidence level for the horizontal position.

An alarm (Figure 4) will be used to warn the operator anytime the position accuracy is outside the EPA-required 5 meters with 95% confidence. Specifically, the alarm will be set to an alarm of 2 meters so the operator will know that the data being collected is at or under 4 meter accuracy with 95% confidence. If the alarm goes off, the operator will reboot the iPad and receiver, and re-establish satellite connection and position accuracy.

Figure 3: EOS Tools Pro App Position Screenshot

Figure 4: EOS Tools Pro App Alarm Screenshot



Recordkeeping Requirements

Serial numbers of the EOS Arrow 100 GNSS receiver unit, iPad, and antenna will be recorded in a field logbook. GPS filenames will be recorded in the logbook. Recording GPS filenames on FSDSs is not required.

Upgrades to GPS Equipment and Software

Hardware and software are subject to change according to availability and/or application updates. The Team Leader (TL) or designee is responsible for contacting the technical support of the vendor if there are any questions regarding setup, operation, or data transfer of models not previously used at OU6.

5.3 GPS Data Transfer from Handheld Units

iPad units connect to the ArcGIS server using Wi-Fi or a cellular data network. The tablets will use the Collector app in offline mode where all data collected are stored on the tablet until the OU6 Libby Collector Map is synced back to the server, creating a redundant data set. This will happen at a minimum of once a day at the conclusion of the work day when the tablet is connected to Wi-Fi or the cellular network. When either a Wi-Fi or cellular connection is available, the tablet will be synced with the server twice per sampling day.

5.4 GPS Data Processing

Data is uploaded from the Collector app to the ArcGIS server. All differential correction is done at the time of collection. Continually monitoring the GPS signal position accuracy using the EOS Tools Pro alarm feature ensures that all position data are within EPA's required 5 meters with 95% confidence.

5.5 GPS Data Transfer to Scribe

Features are exported from the ArcGIS server into an ESRI shapefile format in the WGS84 Datum. These files can then be transferred to EPA or its designee for upload to Scribe using the existing procedure detailed in CDM-Libby-09.

6.0 Quality Assurance/Quality Control (QA/QC)

All GPS data points are visually reviewed and verified during collection and after uploading.

Visual review involves verifying points as they are collected based on GPS position and using aerial imagery base maps. Secondary review takes place using the uploaded data in a geographic information system (e.g., ArcMap), by the TL. Mapped points are viewed to ensure they represent the expected area at the expected property or BNSF MP. Points with obvious errors are omitted and/or recollected.

Verification involves comparing data attributes against EPA-established accuracy criteria, which is performed by onsite data management staff during the data collection process by continually monitoring the position accuracy of the GNSS unit.

LIBBY CHAIN OF CUSTODY DOCUMENTATION

APPROVALS:

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Revision	Date	Principal Changes and Author
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TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a traceable and consistent process for the handling of Chain of Custody (COC) forms. Information from these COC forms is managed in Scribe, an online software program accessible by personnel within the United States Environmental Protection Agency (EPA), as well as approved EPA contractors. Scribe houses data in multiple databases from all aspects of the Libby Asbestos Superfund Site (referred to as the Libby Site from this point forward), and it is necessary that the information on a COC form matches the information in Scribe. This SOP focuses on how to properly document changes or corrections made to a COC or record additional information on a COC.

2.0 SCOPE AND APPLICABILITY

This SOP is specifically intended for application at the Libby Site by sampling agencies, preparation facilities and analytical laboratories associated with the Libby Site. This SOP is applicable during the entire life-span of a sample. The procedures for handling, relinquishing, receiving, and storing COCs for the Libby Site are described.

3.0 SUMMARY OF PROCEDURE

Sample collection agencies and the Sample Preparation Facility (SPF) create an electronic field sample data sheet (eFSDS), an electronic COC (eCOC) and an original hardcopy COC (referred to as the original COC), of which the original COC will accompany the specified samples for the remainder of their life-span. Data from these COCs is maintained in Scribe, which is updated throughout a samples life-span with additional information. Any modification to samples or their COC must be properly documented by hand on the original COC, and this information must be communicated to the appropriate agencies to ensure that the modification is made in all applicable databases.

4.0 ACRONYMS

COC	Chain of Custody
eCOC	Electronic Chain of Custody
EDD	Electronic Data Deliverable
eFSDS	Electronic Field Sample Data Sheet
EPA	United States Environmental Protection Agency
LIMS	Laboratory Information Management System
SOP	Standard Operating Procedure
SPF	Sample Preparation Facility
TAT	Turnaround Time
TEM	Transmission Electron Microscopy

5.0 GENERAL COC INFORMATION

5.1 A COC establishes a traceable, legal record of the possession of samples from the moment the original COC is generated until the samples are disposed of. For this reason, the original COC must accompany the samples at all times. All actions involving a sample

(e.g. removal from one COC to another, re-labeling or re-numbering of a sample) must be recorded on the original COC.

5.2 The Libby Site is an ongoing project that is constantly evolving and changing. Thousands of samples have been collected and are retained indefinitely until their disposal is approved by the EPA. As a result, it is vital that the samples are tracked properly, beginning with the original COC.

5.3 Sampling agencies maintain applicable field databases from which they create original COCs. Some of these samples require preparation to create new samples for analysis. In these cases, the original COC accompanies the original field samples, along with an eFSDS, to the SPF. An eFSDS contains information necessary to create new COCs in Scribe. Once processed, the SPF will create new COC forms from the SPF database. These SPF COC forms are the original COC for these new samples.

5.4 An eCOC is exported from the field or SPF database and is delivered via email to the receiving agency (with the exception of samples that need preparation at the SPF). An eCOC contains all of the sample-specific data that is found within the main body of the original COC.

5.4.1 The purpose of the eCOC is two-fold: to expedite the sample receipt process and to reduce the frequency of data entry errors.
5.4.2 An eCOC is used in addition to the original COC; it does not replace the original COC.
5.4.3 Analytical laboratories are not required to use eCOCs; however, if they wish to use them, they must be provided with the samples.
5.4.4 If an error is found within an eCOC, and that error is not on the original COC, this error must be communicated to the agency that created it to allow the error to be corrected in the applicable database from which it came (this communication may be written or verbal; written communication is not required since the original COC is correct, and the only correction would be to the database from which the eCOC was generated).

5.5 There may be instances when the original COC contains an error or discrepancy that is discovered at some point after the samples are relinquished from the sampling agencies or SPF.

5.5.1 In order to prevent the propogation of the error into the sample analytical results and Scribe, and to rectify the discrepancy, both errors and discrepancies must be communicated between the relinquishing and receiving agencies.
5.5.2 All changes to a COC must be communicated in writing (see Section 8.0).

5.6 Information collected during the entire life-span of a sample is maintained in applicable Scribe databases, and it is important that these databases match the data contained within the original COC.

5.6.1 Most errors on a COC originate in the database from which they are created, and these electronic discrepancies must be addressed as soon as possible.

5.6.2 If the discrepanices are not addressed electronically when they are first discovered, they will need to be addressed at some point in the future, which may cause Electronic Data Deliverable (EDD) and/or Analytical Test Report corrections to be issued (potentially from multiple analytical laboratories), and multiple databases may need to be updated by multiple agencies.

5.7 Analytical laboratories should not use their internal COCs when relinquishing samples to another agency (for exceptions, see Section 7.4). All of the data on each COC is tracked in Scribe, and when a laboratory uses an internal COC, there is no record of that COC in Scribe, and no correlating location for the analytical results within the applicable Scribe databases. When the databases are compared, this lack of correlation will cause problems for the data user.

6.0 RECEIVING A COC

6.1 Upon receipt of samples, the receiving agency will perform, at a minimum, the following sample receiving procedures.

6.1.1 Verify the integrity of the shipping container. If it was damaged during transit and is not the original container, this must be noted on the COC (this may be evident by the taping of the orignal shipping label to the new container, or a new label that is not generated by the relinquisher).

6.1.2 If the samples have not yet been analyzed, verify that a custody seal is present either on each sample or on the master COC bag, and that the seal is not broken. The presence of an unbroken custody seal indicates that the sample contents have not been modified or tampered with.

6.1.2.1 If the seal is broken, it must be noted on the COC, added to the Analytical Test Report Case Narrative and added to the analysis comment field(s) in the EDD.

6.1.2.2 If samples were mistakenly sent to the wrong analytical laboratory, it is possible that the custody seal on the master bag was broken in order to review the COC. If this is the case, it is not necessary to make a notation on the COC; however, the laboratory should attach a new custody seal to the master bag, and then forward the samples to the correct laboratory.

6.1.3 Verify that the sample numbers and tags written on the individual sample bags match those listed on the COC. If the labels on the inner sample bag match the COC, but those on the outer sample bag do not, it is sufficient to correct by hand the outer sample bag label without making a notation of it on the COC. However, if the inner sample bag does not match the COC, then procedures in Sections 8.0 and 9.0 must be followed.

6.1.4 Verify that the Analyses and Turnaround Time (TAT) requested on the COC are what was expected before the samples were shipped. If the TAT is not what was agreed upon before the shipment was made, contact the Sample Coordinator at the SPF for further instructions.

6.1.5 Verify that samples were received on the expected date. If samples are received on a date later than expected, notify the Sample Coordinator at the SPF so that shipping costs may be adjusted/refunded between the SPF and freight agency. The SPF Sample Coordinator must be notified regardless of which agency the

samples are received from.

6.2 All discrepancies must be recorded on the original COC with the initials and date of the individual making the notation. Also, all discrepancies must be communicated either verbally or in writing to the relinquishing agency. If it is determined that there is an error on the COC or sample bags that needs to be corrected, the relinquishing agency must communicate that change in writing to the receiving agency (see Section 8.0).

6.2.1 For procedures on documenting changes to a COC, see Section 9.0.
6.2.2 Once the dicrepancies are resolved, it is important that the resolution be communicated in writing to all agencies involved with the samples up to that point to ensure that the data is consistent within all applicable Scribe databases, as well as the analysis paper trail.
6.2.3 It is important that the eCOC be modified as well if it will be used during sample receipt procedures. However, if samples have already been received and the data entered into a Laboratory Information Management Sysytem (LIMS), it is not necessary to update the eCOC unless it is being retained by the analytical laboratory.

6.3 Once all the information on the COC forms and samples has been verified, and all discrepancies noted, the individual receiving the samples must complete the bottom section of the COC form with their signature, their agency/lab ID (e.g., ESATR8), date and time of sample receipt, and condition of samples upon receipt. All written requests for changes to the COC must be received before the samples are processed any further.

6.4 For all other sample receiving procedures not specified in this SOP, laboratories should reference their internal SOPs.

7.0 RELINQUISHING A COC

7.1 Each agency is responsible for ensuring the accuracy of the COC and the associated samples in their custody. The agency with custody is always required to confirm that the samples within their custody match the COC. This must be completed prior to relinquishing or immediately after receiving a COC regardless of how many times a COC has been relinquished or received previously.

7.2 Typically, the agency receiving samples will make a copy (electronic and/or hardcopy) of the COC for their records. This may be done after the COC is signed as received, after any changes are made to the COC, and again after the COC is signed as relinquished.

7.2.1 Any copy that is made must be marked “Copy of COC” at the top middle of the copy.
7.2.2 Each agency should reference their own internal SOPs for direction on when to make copies of COCs, as well as procedures to follow when relinquishing samples.

7.3 When a COC and its associated samples are reliquished to another location, only the original COC should accompany the samples (see Section 9.4 for exceptions).

7.3.1 In the case of a carbon copy COC, the top white paper is the original that stays with the samples, and all others are the copies which do not accompany the samples.

7.3.2 Corrected COC copies emailed to the relinquishing agency, or any copies made while in the relinquishing agency's custody, are to be retained by that agency and should not be shipped with the samples.

7.4 For Transmission Electron Microscopy (TEM) interlaboratory analyses, new COCs will be created and emailed to the relinquishing laboratory for the specific interlaboratory samples only. Only the grid boxes for those specific samples will be relinquished and sent to the analytcial laboratory.

7.4.1 After the interlaboratory analysis is complete, the interlaboratory COC and its associated grids will be relinquished and returned to the originating laboratory.

7.4.2 Once received at the original location, the grids from the interlaboratory COC will be returned to the original COC sample grid box.

7.4.3 When the original COC and samples are shipped to another location, the grids will be retained by the analytical laboratory along with the interlaboratory COC. A copy of the interlaboratory COC should not accompany the original COC.

8.0 REQUESTING CHANGES TO A COC

8.1 When a change needs to be made to a COC, the request for the change must be made in writing. This written request of a change must be received before samples move beyond initial sample receipt procedures (e.g. before samples are logged into a LIMS, before sample analysis commences).

8.2 The most efficient written communication is for the relinquishing agency to correct, by hand, their copy of the COC, and email this to the receiving agency. This is the only COC that should be emailed to the receiving agency for the correction. Once the database from which the COC was created is updated, a new, corrected COC should not be emailed to the receiving agency. For procedures on documenting changes to a COC, see Section 9.0.

8.2.1 While emailing a corrected COC copy is the most efficient way to communicate the request, it is not required. The relinquishing agency may choose to write out the request in the body of an email, and this may serve as the written request.

8.2.2 If an email is written to request a change, this email must follow the procedures outlined in the remainder of this section.

8.3 If the SPF initially received the samples and then shipped them to an analytical laboratory, the SPF will make the correction on their COC copy, as well as forward the email to the appropriate laboratory so that the correction may be transferred to the original COC.

8.4 Once emailed, the receiving agency will transfer these changes by hand to the original COC (see Section 9.0). The received written request must be printed to hardcopy, initaled and dated to acknowledge it was read and received, labeled with the applicable laboratory

job number, and included in the Analytical Test Report behind the original COC.

8.5 The written request must be filed and saved with the other records retained for that specific COC for an indefinite amount of time, until otherwise directed by the EPA. These records must be made available to any other agency that requests them.

9.0 DOCUMENTING CHANGES TO A COC

9.1 Any time a change needs to be made to a COC, specific procedures must be followed to ensure that all information regarding the change is recorded and consistent. Standard laboratory practices regarding errors and corrections have been modified to accommodate the frequent change of hands for a given COC.

9.2 When information presented on a COC is incorrect, a single line is drawn through it, and the correct information is hand-written next to it, followed by the first initial, last name and agency of the individual requesting the change (if relevant), then the initials and date of the individual hand-writing the change (e.g., ~~2D-00111~~ 2D-00222 per A. Wandler, ESATR8, *DK 03/12/13*).

9.2.1 If the individual recording the change on a COC is the same individual requesting the change, it is not necessary for that individual to record their first initial, last name and agency. They are only required to record the change with their initials and date.

9.2.2 For corrected copy COC written requests, the individual requesting the change is the individual whose initials and date are recorded on the COC copy. This may be different than the individual that actually emails the COC copy as a written request to the receiving laboratory.

9.2.3 For written requests in the body of an email, the individual requesting the change is the individual that sent the email.

9.3 When information needs to be added to a COC, the same procedures in Section 9.2 are followed, except that nothing needs to be crossed out. If the additional information applies all pages of a COC (e.g., master bag custody seal is not present), it should be added to the last page only (the last page typically has more free space than the preceding pages). If the additional information applies to a specific sample, it should be added to the page containing that sample only.

9.3.1 Additional information on a COC should be recorded in open or blank areas, such as a Comments field, below the complete list of samples, or at the bottom of the COC below the signature fields.

9.3.2 If information is added near the margins of a COC, any copies or scans made must clearly show this information.

9.4 When specific samples need to be removed from one COC and added to another COC, the following procedures must be followed.

9.4.1 If the samples being removed from a COC will be shipped to another location before being added to another COC, a copy of the original COC must accompany

them.

9.4.1.1 Make a copy of the original COC before recording any comments and before relinquishment. At the top middle of the COC, write "Copy of COC".

9.4.1.2 On the copy COC, circle the sample numbers being removed. Record a comment indicating that the samples are being removed from the COC and shipped to another location, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date (e.g., "Samples shipped to Troy SPF, removed from this COC and transferred to COC XX-XXXX per A. Wandler, ESATR8, *NM 03/27/13*").

9.4.1.3 At the bottom of the copy COC, indicate the number of samples being shipped and relinquish the COC with a signature and date.

9.4.1.4 On the original COC (which is retained by the relinquishing agency), cross out with a single line the sample numbers being removed. Record a comment indicating that the samples are being removed from the COC, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date.

9.4.2 If the samples being removed from one COC are added to another COC before shipment, only the COC they are added to must accompany them.

9.4.2.1 The original COC should have the sample numbers being removed crossed out with a single line.

9.4.2.2 Record a comment indicating that the samples are being removed from the COC, the new COC number to which the samples are being added (if known), the first initial, last name and agency of the individual making the request (if different than the individual recording the change), and the recorders initials and date.

9.4.3 If the samples are being added to an existing COC, the sample information should be recorded on the COC as additional information (see Section 9.3).

9.4.4 The COC (either new or exisiting) the samples are added to does not require any notations referring to the sample's original COC; notations will already be made on the original COC, as well as in Scribe.

10.0 COC ARCHIVE AND STORAGE

10.1 Samples that are processed at the SPF are split into multiple fractions, and the fractions that are not shipped to an analytical laboratory for analysis are stored in an EPA-approved archive facility.

10.1.1 These fractions are assigned to an archive COC, which is printed and kept with the samples in storage bins. This COC is not signed as relinquished or received because the samples are not relinquished to another agency. However, an initial and date of the individual verifiying the COC and its contents must be recorded in

the bottom right corner of the archive COC.

10.1.2 If a sample on an archive COC needs to be shipped to an analytcial laboratory, it will be removed from the archive COC with a notation stating what sample is being removed, which COC that sample is being transferred to and the recorders initials and date (see Section 9.4).

10.2 When samples are shipped to an EPA-approved archive facility for storage, samples will be received following procedures described in Section 6.0. The original COC will remain with the samples in the storage bin, and a copy of the COC will be maintained by the SPF Sample Coordinator.

10.3 For proper legal management of samples, it is important that the original COC be well documented (as necessary) and that the original COC remain the only copy that stays with the samples.

10.4 Prior to the implementation of this SOP, a COC may have been copied multiple times, each copy containing different added information, and all copies kept with the samples.

10.4.1 These COC copies will remain with the samples, be organized in descending order with the most recent copy placed on top, and stapled together.

10.4.2 If one of these COC needs to be relinquished or modified, only the top (most recent) copy will be signed or modified, but the stack will remain intact unless otherwise directed by the EPA.

11.0 SUPPORTING DOCUMENTATION

The following is a list of documents that agencies should refer to in conjunction with this SOP:

Data Management Plan (posted on Libby e-Room)
Site-Wide Quality Assurance Reference Document (posted on Libby e-Room)
Agency-specific SOPs regarding sample receipt procedures

12.0 REFERENCES

There are no references for this SOP. The information contained within this SOP is based on verbal and written communication between the EPA and Libby contractors.

ATTACHMENT 1

Example Corrected COC

A130158

Send To:
Lab: ESATR8
Lab Address: 16194 W. 45th Drive
Lab_Address2: Golden, CO 80403

From: ESAT Region 8/TechLaw _ CHAIN OF CUSTODY
TroyPrepLabLibby/MT
NoSamples: 6
RevisionNo

No: 13-1143
Lab Contact: Talena Oliver
Lab Phone: (303) 312-7083
DateShipped: 5/13/2013

Lab #	Sample #	Tag	Collected	Analyses	Matrix	COCTurnaround	COCTurnaroundUnits
—	4G-00929	FG1	5/9/2013	PLM-VE	Soil	5	Days
—	4G-00930	FG4	5/9/2013	PLM-VE	Soil	5	Days
—	4G-00931	FG2	5/9/2013	PLM-VE	Soil	5	Days
—	4G-00932	FG3	5/9/2013	PLM-VE	Soil	5	Days
—	4G-00933	FG1	5/9/2013	PLM-VE	Soil	5	Days
—	~~4G-01259~~ 4G-01261	FG4	5/13/2013	PLM-VE	Soil	5	Days
	per A. Wandler, ESATR8, to 05/14/13						
	Sample bags for 4G-00929 labeled "FG2"; relabeled "FG1" per A. Wandler, ESATR8, to 05/14/13						
	Custody Seal labeled "13-1143_C" to 05/14/13						

Special Instructions: SAP Analytical Summary # OU4GI0410 - Rev 3

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
6	Andrea Wandler ESAT	05/13/13	ESATR8	Acceptable 05/14/13	1130						

Date: August 23, 2012 SOP No. EPA-LIBBY-10 (Revision 0)

Title: STANDARD OPERATING PROCEDURE FOR PLM DATA REVIEW AND DATA ENTRY VERIFICATION

Author Natalie Ross (CDM Smith)

SYNOPSIS: This standard operating procedure (SOP) provides a standardized method for review of raw polarized light microscopy (PLM) data and verification of entry of PLM results into the project database. Steps included in this SOP are: a) selection of PLM analyses for review and verification, b) review of the original laboratory PLM benchsheets, and c) verification of the transfer of results from the benchsheets into the project database. This method is applicable for use only at the Libby Asbestos Superfund Site.

APPROVALS:

TEAM MEMBER	SIGNATURE/TITLE	DATE
EPA, Region 8	Jamie Zinner, RPM	9/4/12
CDM Smith	Natalie Ross	9.4.12

Revision	Date	Reason for Revision
0	8/23/12	--

1.0 OBJECTIVE

The purpose of this standard operating procedure (SOP) is to provide a standardized method for consistency review of polarized light microscopy (PLM) data and analytical method(s) in the project database, and verification of results entered in the project database, and the electronic data deliverables (EDDs). **Figure 1** presents a flow diagram of the PLM verification process. Information included in this SOP is organized into the following sections:

2.0 Personnel and Qualifications
3.0 Data Summary Tables
4.0 Selection of PLM Records for Review
5.0 Consistency Review Procedure for PLM-VE
6.0 Consistency Review Procedure for PLM-9002
7.0 Consistency Review Procedure for PLM-Grav
8.0 Verification of Data Transfer from the Benchsheet to the Project Database
9.0 Reporting
10.0 References

2.0 PERSONNEL AND QUALIFICATIONS

Verification Data Manager

The verification data manager should be proficient in Microsoft® Access and Microsoft® Excel as well as be familiar will PLM analytical reporting. The verification data manager is responsible for creating the Data Summary Tables (see **Attachment 1**) by querying the project database. The verification data manager is also responsible for coordinating with the database manager to ensure that discrepancies discovered in the data verification process have been resolved properly.

Database Manager

The database manager is responsible for maintaining the project dataset/laboratory documentation and coordinating with the laboratories to communicate discrepancies discovered during the verification process.

Data Verifier

The data verifier must be skilled and/or trained in interpretation of raw laboratory benchsheets and electronic data reporting files in support of PLM analysis. Data verifiers must be well-versed in data reporting requirements and recording rules as specified in the National Institute for Occupational Safety and Health (NIOSH) Method 9002 (PLM-9002) and the most recent versions of site specific SOPs SRC-LIBBY-03 (referred to as PLM visual area estimation or "PLM-VE") and SRC-LIBBY-01 (referred to as PLM gravimetric analysis or "PLM-Grav").

Data verifiers must also be well-versed in project-specific recording rules as presented in the governing project documents that specify sampling and analysis procedures (e.g., Site

Management Plan [SMP], Sampling and Analysis Plan [SAP], Quality Assurance Project Plan [QAPP]) to perform the required consistency reviews.

Data Verification Coordinator

The data verification coordinator (DVC) must be skilled in interpretation of raw data laboratory benchsheets and electronic data reporting files in support of PLM analysis. DVCs must be well-versed in PLM methods and recording rules, as well as any in project-specific analytical requirements, as presented in the governing project documents that specify sampling and analysis procedures (e.g., SMP, SAP, QAPP). Lastly, DVCs are responsible for the following:

--Ensuring that verification reports are clear and accurate
--Ensuring that the steps outlined in this SOP are followed
--Training of data verifiers

3.0 DATA SUMMARY TABLE

Data Summary Tables are to be created by the verification data manager in Microsoft® Excel format and provided to the data verifier. Data Summary Tables will be used by the data verifier to select the PLM analyses for verification and to compare the project database results to the hand-written laboratory benchsheets. **Attachment 1** presents an example of the Data Summary Table that illustrates the analytical and result information for PLM that will be verified.

4.0 SELECTION OF PLM RECORDS FOR REVIEW

The fraction of PLM records selected for review and verification will depend upon project-specific data quality needs. If less than 100% of analyses are to be verified, the goals for selecting a representative subset of PLM results for review and verification are provided below.

Over the course of a project, a minimum of ten percent (10%) of all field samples for which PLM analyses have been performed will be reviewed and verified. Laboratory quality control (QC) analyses will be excluded from the verification process (as their review is conducted as part of data validation). Selections should be made to ensure representation across the laboratory analysts performing PLM analyses. All PLM analyses will be stratified by analyst, with the number of analyses from each analyst selected for verification being in proportion to the total number analyzed. In addition, analyses will be stratified according to detect/non-detect status, with approximately 50% of the analyses selected for verification being detects, and 50% being non-detects. The following table illustrates the selection process if the goal is to select 10% of PLM analyses for review:

	Number PLM Analyses Completed			Number PLM Analyses Selected		
Analyst	Detect	Non-Detect	Total	Detect	Non-Detect	Total
1	14	112	126	11	6	17
2	20	421	441	16	22	38
3	2	4	6	2	1	3

Analyst	Number PLM Analyses Completed			Number PLM Analyses Selected		
	Detect	Non-Detect	Total	Detect	Non-Detect	Total
4	0	8	8	0	1	1
Total	36	545	581	29	30	59

	Number to be Selected Based on 10% Goal	Actual Number Selected
Total	58	59
Detect	29	29
Non-Detect	29	30

In this example, there are a total of 581 analyses available (36 detects + 545 non-detects), analyzed by four different analysts. Thus, the total number of analyses to be selected for review is 10% x 581 = 58.1 (rounded to 58). This total is to be split evenly between detects (29) and non-detects (29). The number of detects and non-detects selected for each analyst is calculated by multiplying the target number (29) by the fraction of the total detects and non-detects evaluated by the analyst. For example, for Analyst 1:

Number of detects selected = 29 x (14/36) = 11.3 (rounded to 11)
Number of non-detects selected = 29 x (112/545) = 5.9 (rounded to 6)

If an analyst has analyzed at least one analysis in a category (detect or non-detect), the minimum number of analyses to be selected is one. For example, for Analyst 4, the number of detects analyzed is zero, so the number of detects selected is zero. For Analyst 4, the number of non-detects to be selected (computed using the approach above) is:

Number of non-detects selected = 29 x (8/545) = 0.4

In this case, the number selected for verification is set to the minimum of 1.

As seen, this procedure will tend to select a higher proportion of detects (29 of 36 analyses, 81%) than non-detects (30 of 545 analyses, 6%). This approach is used because it is considered likely that the incidence of errors will be higher in analyses with detected asbestos than in analyses that are non-detect.

The analyses that have been selected for analytical result verification should also undergo a verification of the field sample data sheet (FSDS) information. This verification process is outlined in Libby-specific SOP EPA-LIBBY-11.

5.0 CONSISTENCY REVIEW PROCEDURE FOR PLM-VE

For each PLM-VE analysis to be verified, the data verifier will locate the original hand-written laboratory benchsheets within the appropriate laboratory job[a]. The data verifier will either print hard copies (if laboratory job provided as a PDF) or make photocopies (if laboratory job is provided as a hard copy data package) of the associated laboratory documentation for each PLM analysis selected for verification so that a hard copy is available for use in the verification.

Figure 2 presents an example laboratory benchsheet for PLM-VE. The data verifier will review the original hand-written laboratory benchsheets to determine if the reported results are in accordance with PLM-VE reporting rules and any project-specific recording rules. The types of information to be reviewed include:

--Asbestos is classified into one of three categories; Libby amphibole (LA), other amphibole asbestos (OA), and chrysotile (CH)

--The reported qualifier codes for LA, OA and CH are consistent with the PLM-VE reporting rules. Valid qualifier codes for LA include "ND" (not detected), "Tr" (trace) and "<" (less than). Valid qualifier codes for OA and CH include "ND" and "<".

--When the reported qualifier is "<", the concentration for LA, OA and CH should be recorded as 1%.

--When the reported concentration for LA, OA, and CH is equal to or greater than 1%, a numeric integer (1, 2, 3, etc.) should be recorded in the concentration column without an entry in the qualifier column.

Important Notice: Data reporting requirements have changed over time. Concentration values recorded as mass fraction (MF) percent, area fraction (AF) percent, or FRAC% on the benchsheet are equivalent to the "Conc" CharacteristicID in the project database.

--For LA, results are assigned to one of four "bins" with the associated qualifiers and concentrations, as follows:

Bin	Qualifier	Concentration
A	ND	
B1	Tr	
B2	<	1
C		1,2,3, etc.

--If recorded, OA structure types are identified as "AMOS" (amosite), "ANTH" (anthophyllite), "CROC" (crodidolite), or "MULTI" (multiple).

--When asbestos fibers are positively identified in a sample, optical properties should be recorded for each asbestos type present.

[a] The laboratory job is either a hard copy data package or a scanned copy of the hard copy data package provided as a portable document file (PDF) by the analytical laboratory.

--When non-asbestos material (NAM) fibers are observed, at least one optical property should be recorded on the benchsheet that distinguishes the fiber from asbestos. This field is not required to be entered into the EDD.

> *Important Notice: Data reporting requirements have changed over time. Historical analyses may not have met this requirement.*

--If optical properties are recorded on the benchsheet, the ambient temperature of the laboratory is also recorded.

> *Important Notice: Data reporting requirements have changed over time. Historical analyses may not have met this requirement.*

6.0 CONSISTENCY REVIEW PROCEDURE FOR PLM-9002

For each PLM-9002 analysis to be verified, the data verifier will locate the original hand-written laboratory benchsheets within the appropriate laboratory job[b]. The data verifier will either print hard copies (if laboratory job provided as a PDF) or make photocopies (if laboratory job is provided as a hard copy data package) of the associated laboratory documentation for each PLM-9002 analysis selected for verification so that a hard copy is available for use in the verification.

Figure 3 presents an example laboratory benchsheet for PLM-9002. The data verifier will review the original hand-written laboratory benchsheets to determine if the reported results are in accordance with PLM-9002 reporting rules and any project-specific recording rules. The types of information to be reviewed include:

--Asbestos is classified into one of three categories: Tremolite-Actinolite (TREM-ACTN), OA, and CH

--The reported qualifier codes for TREM-ACTN, OA and CH are consistent with the method reporting rules. Valid qualifier codes include "ND" (not detected) and "<" (less than).

--When the reported qualifier is "<", the concentration for TREM-ACTN, OA and CH should be recorded as 1%.

--When the reported concentration for TREM-ACTN, OA, and CH is equal to or greater than 1%, a numeric integer (1, 2, 3, etc.) should be recorded in the concentration column without an entry in the qualifier column.

> *Important Notice: Data reporting requirements have changed over time. Concentration values recorded as mass fraction (MF) percent, area fraction (AF) percent, or FRAC% on the benchsheet are equivalent to the "Conc" CharacteristicID in the project database.*

[b] The laboratory job is either a hard copy data package or a scanned copy of the hard copy data package provided as a portable document file (PDF) by the analytical laboratory.

--Results are not assigned to bins.

--If recorded, OA structure types are identified as "AMOS" (amosite), "ANTH" (anthophyllite), "CROC" (crodidolite), or "MULTI" (multiple).

--When asbestos fibers are positively identified in a sample, optical properties should be recorded for each asbestos type present.

--When non-asbestos material (NAM) fibers are observed, at least one optical property should be recorded on the benchsheet that distinguishes the fiber from asbestos. This field is not required to be entered into the EDD.

Important Notice: Data reporting requirements have changed over time. Historical analyses may not have met this requirement.

-- If optical properties are recorded on the benchsheet, the ambient temperature of the laboratory is also recorded.

Important Notice: Data reporting requirements have changed over time. Historical analyses may not have met this requirement.

7.0 CONSISTENCY REVIEW PROCEDURE FOR PLM-GRAV

For each PLM-Grav analysis to be verified, the data verifier will locate the original hand-written laboratory benchsheets within the appropriate laboratory job[c]. The data verifier will either print hard copies (if laboratory job provided as a PDF) or make photocopies (if laboratory job is provided as a hard copy data package) of the associated laboratory documentation for each PLM analysis selected for verification so that a hard copy is available for use in the verification.

Figure 4 presents an example laboratory benchsheet for PLM-Grav. The data verifier will review the original hand-written laboratory benchsheets to determine if the reported results are in accordance with PLM-Grav reporting rules and any project-specific recording rules. Examples of information to be reviewed include:

--The reported qualifier codes for LA, OA, and CH are consistent with the method reporting rules. Valid qualifier codes include "ND" (not detected) and "Tr" (trace).

--If recorded, OA structure types are identified as "AMOS" (amosite), "ANTH" (anthophyllite), "CROC" (crocidolite) or "MULTI" (multiple).

--If a concentration value is reported in the project database, the data verifier will check that the following calculations are accurate based on the hand-written results recorded on the laboratory benchsheet:

[c] The laboratory job is either a hard copy data package or a scanned copy of the hard copy data package provided as a portable document file (PDF) by the analytical laboratory.

Asbestos concentration (%) = [(mass of asbestos/1000) /mass of sample] x 100

where:

Mass of asbestos (LA, OA or CH) in milligrams (mg) = [*weight of sample container and asbestos – weight of empty sample container]*

1000 = conversion factor (covert from mg to g)

Mass of sample in grams (g) = [*weight of sample container and total sample – weight of empty sample container]*

100 = conversion factor (convert from fraction to percentage)

8.0 VERIFICATION OF DATA TRANSFER FROM THE BENCHSHEET TO THE PROJECT DATABASE

The data verifier will ensure that data entered into the project database were entered properly. This data transfer verification can be accomplished by comparing the data in the project database (i.e., the data provided in the Data Summary Tables) to the handwritten benchsheets.

The data verifier will verify the analysis-specific information provided in the Data Summary Tables (see **Attachment 1**) against the original laboratory documentation (e.g., laboratory benchsheets). [Note: Whenever possible, verification should be performed against hand-written notations, NOT internal laboratory summary tables prepared from hand-written notes. If hand-written notes are not available, this should be noted in the written report summarizing findings and recommendations that will be created at the end of the verification process.] Some examples of analysis-specific information that will be verified are provided below:

--Laboratory Name
--Laboratory Job Number
--SOP Name/Revision
--Instrument ID
--Sample Number
--Tag
--QC Type
--Lab Sample ID
--Date Analyzed
--Analyst Name
--Sample Appearance (e.g., tan, non-fibrous, homogeneous)
--Deviation (Y/N)
--Comments
--Non-Fibrous Matrix Materials (if reported)
--Temperature (if reported in the project database)

For PLM-VE Results:

--LA Bin

--Concentration result for LA, OA, and CH (Note: this is reported as "Conc" in the project database).

For PLM-9002 Results:

--Concentration result for TREM-ACTN, OA, and CH (Note: this is reported as "Conc" in the project database).

For PLM-Grav Results:

--Concentration result for LA, OA, and CH (Note: this is reported as "Conc" in the project database).

Optical Property Data for Detected Samples *(for PLM-VE and PLM-9002 only):*

--Habit (acicular, fiber bundles, prismatic, straight, tapered)
--Fiber Color (blue, brown, colorless, gray, green, red, tan yellow)
--Sign of Elongation (+/-)
--Pleochroism (Y/N)
--Extinction Angle (parallel, inclined)
--Refractive Index (α)
--Refractive Index (γ)
--Birefringence (high, low, medium, none)

If a discrepancy is noted, the verifier should confirm where in the data flow process that the error occurred. This can be achieved by reviewing the EDD that was submitted by the laboratory to confirm whether or not the data entry occurred successfully. If there is an error in the data entry to the EDD, correction to the EDD is needed. Otherwise, it is likely that the data upload procedure resulted in a misrepresentation of the data. In this case, the database manager will need to revise the upload procedure and reload the EDD.

9.0 REPORTING

For each field to be verified, if the data in the Data Summary Table matches the information in the hard copy laboratory job documentation, mark the appropriate field on the hard copy with a check mark. If the Data Summary Table does not match the hard copy laboratory job documentation, circle the incorrect entry on the hard copy, and note the specific discrepancy in the Data Summary Table in the "Comment" column (see **Attachment 1**). For example, "Analysis date is 1/1/11 based on hard copy, but 1/2/11 in the EDD/database".

As the verification of each selected analysis is completed, the data verifier will enter their company name and their first initial and last name (e.g., E. Smith) in the Data Summary Table in the appropriate columns.

When the verification is complete for all analyses selected, the data verifier will prepare an electronic data verification package. This package will consist of:

--A written report summarizing findings and recommendations. **Attachment 2** provides an example template for reporting PLM data verification results.
--A scanned copy of the hard copy documentation used in the verification process (which includes all verification check marks for reviewed fields).
--An electronic attachment of the Data Summary Table (which includes any data verifier comments).

The DVC will review the data verification package for accuracy and completeness. If any deficiencies are noted, the DVC will re-train verification personnel and make any corrections as necessary.

In addition to verifying all issues noted in summary report, the DVC will perform an independent data verification of 5% of the analyses verified to ensure that any potential issues have been identified correctly. The DVC will indicate in **Attachment 1** which analyses were selected for review. If any deficiencies are noted, the DVC will re-train verification personnel and make any corrections as necessary. If the DVC disagrees with the error noted in the Data Summary Table, the discrepancy will be revised, and the DVC will replace the data verifiers name with his/her name for the analysis. The summary report will be revised by the DVC to reflect any changes as needed.

The electronic data verification package will then be provided to the appropriate project database manager, or their designee, to facilitate the correction process for laboratory EDDs and/or the hand-written laboratory benchsheets by the analytical laboratory. The project database manager, or their designee, is also responsible for ensuring that any database upload issues are resolved. The verification data manager, or their designee, will record the resolution date of any corrections in the appropriate column of the Data Summary Table. Note that all of the following criteria must have been met for a PLM analysis to be considered verified:

--All necessary corrections have been made to the laboratory EDD.
--The corrected laboratory EDD has been re-submitted by the analytical laboratory to the appropriate parties (as specified in the governing project documents).
--The corrected laboratory EDD has been uploaded to the project database.
--All necessary corrections have been made to the hand-written laboratory benchsheet.
--The corrected hand-written laboratory benchsheet has been re-submitted by the analytical laboratory to the appropriate parties.
--Signatures for the data verifier, DVC, and verification data manager have been added to the verification summary report.

10.0 REFERENCES

ESAT (Environmental Services Assistance Team). 2012. SOP SRC-LIBBY-03: *Analysis of Asbestos Fibers in Soil by Polarized Light Microscopy.* Prepared by ESAT, Region 8.

ESAT (Environmental Services Assistance Team). 2012. SOP SRC-LIBBY-01: *Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy.* Prepared by ESAT, Region 8.

NIOSH Method 9002: Asbestos (bulk) by PLM. Manual of Analytical Methods, 4th Edition. August 1994.

FIGURE 1

PLM VERIFICATION PROCESS

FIGURE 1. PLM VERIFICATION PROCESS

Personnel	Step
Verification Data Manager	1. Create Data Summary Tables in Excel and provide to the verifier.
Verifier	2. Select PLM analyses for review.
	3. Locate hand-written laboratory documentation (laboratory benchsheets, point count worksheets) and print or photocopy hard copies for selected analyses.
	4. Perform a consistency review utilizing the Data Summary Tables and hand-written laboratory
	5. Verify that analysis-specific data were correctly transferred from the laboratory documentation to the project database (utilizing the Data Summary Tables and hand-written laboratory
	6. Verify the assigned bin (if applicable) and asbestos percent values reported in the Data Summary Tables (utilizing the hand-written laboratory documentation).
	7. Verify the optical properties were correctly transferred from the laboratory benchsheet to the database (utilizing the Data Summary Tables and hardcopy hand-written laboratory benchsheets).
	8. Create electronic data verification package and provide to Data Verification Coordinator.
Data Verification Coordinator (DVC)	9. Review electronic data verification package and
	10. Provide electronic data verification package to
Database Manager	11. Correspond with laboratories to ensure appropriate corrections are made to laboratory EDDs/ benchsheets.
	12. Upload corrected laboratory EDDs to project database.
	13. Update project file with revised laboratory
Verification Data Manager	14. Record issue resolution date in the Data Summary Table.
Verifier, DVC, and Verification Data Manager	15. Sign and date verification summary report.

PLM = polarized light microscopy
COC = chain of custody
EDD = electronic data deliverable

FIGURE 2

EXAMPLE OF PLM-VE LABORATORY BENCHSHEET

FIGURE 2. EXAMPLE PLM-VE LABORATORY BENCHSHEET

Page _______ of _______

Lab ID ______________________________ Date Received ______________ Instrument ID ______________________

Lab Job Number ______________________________ Analytical Method SOP Name/Revision ______________________

EPA Index ID	Tag	QC Type (NOT QC, LDS, LDC)	Lab Sample ID	Date Analyzed	Analyst Name	Stereomicroscopy Examination					Libby Amphibole		Other Amphibole			Chrysotile		Deviation (Yes/No)	Comments (see below)	Optical Properties for Libby Amphibole (see key for appropriate data inputs)								Type and % of NAM Fibers (w/Optical Properties)									Non-Fibrous Matrix Materials[3]	Temp (°C)
						Sample Appearance	Est. % LA		Est. % OA and CH		Qual (ND, Tr, <)	Conc (%)	Qual (ND, <)	Conc (%)	OA Type (AMOS, ANTH, CROC, MULTI)	Qual (ND, <)	Conc (%)			Habit	Fiber Color	Sign Elong. (+/-)	Pleoch. (Yes/No)	Angle Extinct. (I/P)	Ref. Index α	Ref. Index γ	Biref.	Cellulose		Fiberglass		Synthetic		Other				
							Qual (ND, Tr, <)	Conc (%)	Qual (ND, <)	Conc (%)																		Conc (%)	OP[1]	Conc (%)	OP[1]	Conc (%)	OP[1]	Type[2]	Conc (%)	OP[1]		

Comments (Use back if needed)

Notes:

1) Optical property that distiguishes fibrous material from asbestos (I = Isotropic, H = Habit, B = High Birefringence, U = Undulatory Extinction, RI = Refractive Index, O = Opaque, S = Sign of Elongation, P = Parallel Extinction)

2) T = Talc, W = Wollastonite, K = Kyanite, Ho = Hornblende, CC = Calcic Clinopyroxene, Ha = Hair, R = Rutile

3) S = Sand, C = Clay, O = Opaques, Q = Quartz, F = Feldspar, M = Mica

FIGURE 3

EXAMPLE OF PLM-9002 LABORATORY BENCHSHEET

FIGURE 3. EXAMPLE PLM NIOSH 9002 LABORATORY BENCHSHEET

Lab ID _____ Date Received _____ Instrument ID _____

Lab Job Number _____ Analytical Method SOP Name/Revision _____

EPA Index ID	Tag	Matrix (Bulk, Soil, Sediment)	QC Type (NOT QC, LDS, LDC)	Lab Sample ID	Date Analyzed	Analyst Name	Stereomicroscopy Examination					Tremolite-Actinolite		Other Amphibole			Chrysotile		Deviation (Yes/No)	Comments (list below)	OPTICAL PROPERTIES FOR TREMOLITE-ACTINOLITE (see key for appropriate data inputs)								Temp (°C)
							Sample Appearance	Est. % Trem-Actn		Est. % OA and CH		Qual (ND, <)	Conc (%)	Qual (ND, <)	Conc (%)	OA Type (AMOS, ANTH, CROC, UNK)	Qual (ND, <)	Conc (%)			Habit	Fiber Color	Sign Elong. (+/-)	Pleoch. (Yes/No)	Angle Extinct.	Ref. Index α	Ref. Index γ	Biref.	
								Qual (ND, <)	Conc (%)	Qual (ND, <)	Conc (%)																		

Comments (Use back if needed)

FIGURE 4

EXAMPLE OF PLM-GRAV LABORATORY BENCHSHEET

FIGURE 4. EXAMPLE PLM-GRAV LABORATORY BENCHSHEET

Stereomicroscopic and Gravimetric Analysis of Coarse Soil

Lab ID: | **Instrument ID:** | **Analysis Method SOP Version:**

Lab Job No.: | **Date Received:**

Calculated automatically in the "Electronic Data Entry" form. Do not enter data here.

EPA Index ID	Tag	Matrix (Soil, Sediment)	QC Type (Not QC, LDS, LDC)	Lab Sample ID	Date Analyzed	Analyst Name	Status (1 = Analyzed; 2 = Lost; 3 = Damaged; 4 = Cancelled)	Total Sample Weight (**g**)			Mass of Asbestos Particles (**mg**)																Comments (see Notes below)	Temp (°C)
											Libby Amphibole (LA) Asbestos				Other Amphibole (OA) Asbestos					Chrysotile (CH) Asbestos									
								Tare Weight (g) Empty Container	Mass of Sample + Container (g)	Mass of Sample (g)	LA Qual* (ND, Tr)	Tare Weight - Container (mg)	Mass of LA + Container (mg)	Mass (mg) LA	OA Qual* (ND, Tr)	OA Type** (AMOS, ANTH, CROC, MULTI)	Tare Weight - Container (mg)	Mass of OA + Container (mg)	Mass (mg) OA	CH Qual* (ND, Tr)	Tare Weight - Container (mg)	Mass of CH + Container (mg)	Mass (mg) CH	% LA	% OA	% CH		

Notes:

*Qualifier codes: ND = No asbestos observed.
Tr = Trace levels observed but not quantified.

**OA Type codes: AMOS = Amosite
ANTH = Anthophyllite
CROC = Crocidolite
MULTI = Multiple Types

Comment Codes (user-defined):

ATTACHMENT 1

EXAMPLE OF DATA SUMMARY TABLES

ATTACHMENT 1A. DATA SUMMARY TABLE FOR PLM-VE VERIFICATION

Analysis Lab ID	Lab Job Number	Analysis Method	Method SOP	Instrument ID	Samp. No	Tag	Matrix	QC Type	Lab Sample ID	Analysis Date	Analyst Name	Sample Appearance	Deviation	Comments	LA Bin	LA Conc.	OA Conc.	CH Conc.	Optical Property Data for Detected Samples							
																			FBRCOLOR	ELONG	PLEOCH	EXTINCT	RIALPHA	RIGAMMA	BIREF	HABIT

ATTACHMENT 1B. DATA SUMMARY TABLE FOR PLM 9002 DATA VERIFICATION

Analysis Lab ID	Lab Job Number	Analysis Method	Method SOP	Instrument ID	Samp. No	Tag	Matrix	QC Type	Lab Sample ID	Analysis Date	Analyst Name	Sample Appearance	Deviation	Comments	LA Conc.	OA Conc.	CH Conc.	Optical Property Data for Detected Samples							
																		FBRCOLOR	ELONG	PLEOCH	EXTINCT	RIALPHA	RIGAMMA	BIREF	HABIT

ATTACHMENT 1C. DATA SUMMARY TABLE FOR PLM-GRAV DATA VERIFICATION

Analysis Lab ID	Lab Job Number	Analysis Method	Method SOP	Instrument ID	Samp. No	Tag	Matrix	QC Type	Lab Sample ID	Analysis Date	Analyst Name	LA Conc.	OA Conc.	CH Conc.

ATTACHMENT 2

EXAMPLE OF PLM DATA VERIFICATION SUMMARY REPORT

PLM CONSISTENCY REVIEW AND DATA TRANSFER VERIFICATION REPORT

Project/Dataset Description:_____

SUMMARY OF FINDINGS AND DATA QUALITY IMPLICATIONS

_____

_____

_____

_____

_____

_____

_____

Recommendations for future review and verification: _____

_____

_____

_____

_____

Data Verifier: _____ ***Date:*** _____

Data Verification Coordinator: _____ ***Date:*** _____

Verification Data Manager*: _____ ***Date:*** _____

****The verification data manager acknowledges that all issues discovered during the verification process have been resolved and that the following criteria have been met:***

- All necessary corrections have been made to the laboratory EDD.
- The corrected laboratory EDD has been re-submitted by the analytical laboratory to the appropriate parties (as specified in the governing project documents).
- The corrected laboratory EDD has uploaded to the project database.
- All necessary corrections have been made to the hand-written laboratory benchsheet.
- The corrected hand-written laboratory benchsheet has been re-submitted by the analytical laboratory to the appropriate parties.

PLM-VE SELECTION AND CONSISTENCY REVIEW RESULTS

Summary of available analyses for date range specified –

Analyst, Lab	Number of PLM-VE Analyses			Number of PLM-VE Analyses Selected for Review		
	Detect	Non-Detect (Bin A)	Total	Detect	Non-Detect (Bin A)	Total
Analyst #1, Lab Name						
Analyst #2, Lab Name						
…						
Total						

	Goal	Actual
Selected Total	_____	_____
Selected Detects	_____	_____
Selected Non-Detects	_____	_____

Detailed summary of bench sheet consistency review –

Number of analyses reviewed: _____ (_____% of total analyses selected)

If not all analyses could be reviewed, provide a brief explanation for why: _____

_____

Number of analyses with recording issues identified: _____ (_____% of total analyses reviewed)

Types of recording issues identified (indicate the number of analyses):

_____ Qualifier codes are inconsistent with the method reporting rules

_____ Reported value does not use correct binning category

_____ If recorded, OA structure types are not identified

_____ Optical properties are not recorded for reported LA fibers

_____ At least one optical property was not recorded for non-asbestos fibrous material

Do the recording issues identified appear to be associated with a particular analyst or laboratory? Yes No

If yes, identify the analyst and/or laboratory: _____

_____

PLM-9002 SELECTION AND CONSISTENCY REVIEW RESULTS

Summary of available analyses for date range specified –

Analyst, Lab	Number of PLM-9002 Analyses			Number of PLM-9002 Analyses Selected for Review		
	Detect	Non-Detect	Total	Detect	Non-Detect	Total
Analyst #1, Lab Name						
Analyst #2, Lab Name						
…						
Total						

	Goal	Actual
Selected Total	_____	_____
Selected Detects	_____	_____
Selected Non-Detects	_____	_____

Detailed summary of bench sheet consistency review –

Number of analyses reviewed: _____ (_____% of total analyses selected)

If not all analyses could be reviewed, provide a brief explanation for why: _____

_____

Number of analyses with recording issues identified: _____ (_____% of total analyses reviewed)

Types of recording issues identified (indicate the number of analyses):

_____ Qualifier codes are inconsistent with the method reporting rules

_____ If recorded, OA structure types are not identified

_____ Optical properties are not recorded for reported TREM-ACTN fibers

_____ At least one optical property was not recorded for non-asbestos fibrous material

Do the recording issues identified appear to be associated with a particular analyst or laboratory? Yes No

If yes, identify the analyst and/or laboratory: _____

_____

PLM-GRAV SELECTION AND CONSISTENCY REVIEW RESULTS

Summary of available analyses for date range specified –

Analyst, Lab	Number of PLM-Grav Analyses			Number of PLM-Grav Analyses Selected for Review		
	Detect	Non-Detect	Total	Detect	Non-Detect	Total
Analyst #1, Lab Name						
Analyst #2, Lab Name						
…						
Total						

	Goal	Actual
Selected Total	_____	_____
Selected Detects	_____	_____
Selected Non-Detects	_____	_____

Detailed summary of bench sheet consistency review –

Number of analyses reviewed: _____ (_____% of total analyses selected)

If not all analyses could be reviewed, provide a brief explanation for why: _____

_____

Number of analyses with recording issues identified: _____ (_____% of total analyses reviewed)

Types of recording issues identified (indicate the number of analyses):

_____ Qualifier codes are inconsistent with the method reporting rules

_____ If recorded, OA structure types are not identified

_____ Asbestos concentration calculation is incorrect or inputs are missing

Do the recording issues identified appear to be associated with a particular analyst or laboratory? Yes No

If yes, identify the analyst and/or laboratory: _____

_____

DATA TRANSFER VERIFICATION RESULTS

Number of analyses verified[1]: _____ (_____% of total analyses selected)

Number of analyses with data transfer issues identified: _____ (_____% of total analyses verified)

Examples of data transfer issues identified:

_____ Incorrect/missing information on analysis details (e.g., lab job number, analysis date)

_____ Results for PLM-9002 are not reported as TREM-ACTN

_____ Results for PLM-VE and PLM-Grav are not reported as LA

_____ Reported value for PLM-VE does not use correct binning category

_____ Optical properties PLM-VE and PLM-9002 are missing or inconsistent

Do the data transfer issues identified appear to be associated with a particular analyst or laboratory? Yes No

If yes, identify the analyst and/or laboratory: _____

_____

Comments: _____

_____

_____

_____

ISSUE RESOLUTION AND STATUS

_____

_____

_____

_____

_____

_____

[1] Only those analyses that have passed the bench sheet consistency review are included in the data transfer verification.

STANDARD OPERATING PROCEDURE FOR THE VALIDATION OF LIBBY POLARIZED LIGHT MICROSCOPY (PLM) DATA DELIVERABLES

APPROVED BY:

Originator	Date 6/19/2013
Technical Reviewer (if applicable)	Date 6/21/2013
QATS Quality Assurance Officer	Date 6/19/13
QATS Program Manager	Date 6/19/13
EPA Task Order Manager (if applicable)	Date 6/26/13
EPA Task Order Project Officer	Date 07/15/2013

RECORD OF SCHEDULED REVIEWS:

Date	Reviewed By	Date	Reviewed By
6/19/2013			

CONTENTS

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) details the procedures for the validation of asbestos by Polarized Light Microscopy (PLM) data deliverables. These procedures have been developed to apply to asbestos bulk, soil, and other types of samples from Libby Site locations and analyzed for PLM by the most current revisions of the project specific SOPs for PLM Visual Estimation (PLM-VE), SRC-Libby-03, and PLM Gravimetric Analysis (PLM-Grav), and SRC-Libby-01, and those laboratory modifications specified in the applicable Sampling and Analysis Plans (SAP) Analytical Requirements Summary.

2.0 SUMMARY

2.1 Prior to analysis, samples are often subject to particle size reduction and/or homogenization techniques, including milling, sieving, and teasing.

2.2 For asbestos analysis, a representative aliquot of the sample is examined at low magnification with a stereomicroscope for homogeneity and preliminary fibrous content (%). Positive qualitative identification of fibrous materials is made by the examination of fiber morphology and the observed optical properties, with semi-quantitative analysis, achieved using reference slides of known asbestos percentages.

2.3 A transcription check of the data is performed through comparison of the specified data elements in the submitted sample collection, electronic, and hard copy deliverables to ensure the accuracy of data entry and other transcription activities. Data validation is a thorough review of the deliverables for completeness, accuracy, and compliance with the applicable methodologies and requirements, and the recalculation of sample results. Unless otherwise specified, validation is performed on 100% of the received deliverables. Both the transcription check and validation procedures are performed with the aid of a checklist, which is completed during the validation activities. Any discrepancies found during the transcription check are documented in the EDD/Bench Sheet Discrepancy Table of the Data Validation Report.

2.4 The procedures detailed herein conform to the QATS ISO 9001 Quality Management System (QMS) as described in the current QATS Quality Manual.

3.0 NOTES AND PRECAUTIONS

3.1 Chain-of-custody procedures must be maintained for each data package to ensure data integrity.

3.2 The hardcopy data package must be scanned into PDF format to ensure and maintain data integrity.

3.3 Security procedures must be maintained and applied to all EPA data from the time of receipt through release.

3.4 Use the current approved Data Review Checklist for the Validation of Libby PLM Data Deliverables to generate validation reports and attach the checklist to the validation report as an Appendix.

4.0 DEFINITIONS

4.1 ASBESTOS – The generic name used for a group of naturally occurring mineral silicate fibers of the serpentine and amphibole series, displaying similar physical characteristics although differing in composition.

4.2 BIREFRINGENCE – The splitting of one ray of light into two in an anisotropic medium.

4.3 COLOR and PLEOCHROISM – The phenomenon of substances showing different colors in different vibration directions. The colors show change with the orientation of the crystal and can be seen only with plane polarized light.

4.4 EXTINCTION ANGLE – The angle between the nearer vibration direction and a prominent direction of the crystal, which never exceeds 45°.

4.5 HABIT – The general shape of a crystal (i.e. rods, plates, needlelike, bundle, or prismatic).

4.6 LA (LIBBY-CLASS AMPHIBOLE) – Structures having an amphibole SAED pattern and an EDS composition similar to the range of fiber types observed in ores from the Libby mine (Meeker *et al*. 2003). This is a sodic tremolitic solid solution series of minerals including winchite and richterite, with lower amounts of tremolite, magnesio-arfvedsonite, magnesio-riebeckite, and edenite/ferro-edenite. Depending on the valence state of iron, some minerals may also be classified as actinolite.

4.7 REFRACTIVE INDICES (ALPHA and GAMMA) – The radio of the velocity of light in a vacuum to the velocity in some medium.

4.8 SIGN OF ELONGATION – Refers to the elongation of a substance in relation to refractive indices. If it is elongated in the direction of the high refractive index it is said to be positive, and if it is elongated in the direction of the low refractive index it is said to be negative.

5.0 MATERIALS

5.1 Personal Computer (PC) with latest available versions of appropriate client contract specified software for generating reports, printer, and accessories.

5.2 Project-specific requirements which can be found in the applicable SAP Analytical Requirements Summary.

5.3 SOP SRC-Libby-01 (Current revision) – Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy

5.4 SOP SRC-Libby-03 (Current revision) – Analysis of Asbestos Fibers in Fine Soil by Polarized Light Microscopy

6.0 PROCEDURES

The following procedures describe the evaluation and validation of asbestos in soil by PLM.

6.1 DATA VALIDATION QUALIFIERS, REASON CODES, AND DATA PACKAGE INVENTORY

6.1.1 The data qualifiers in the following table are assigned to results in the hard copy data validation process. If additional qualifiers are used (i.e. X), a complete explanation of those qualifiers must accompany the data review. Following the Data Qualifier table below is the Reason Code table. The reason codes are assigned to qualified results in the hard copy data validation process to explain the reason for the qualifier.

Data Qualifier	Qualifier Definition
J	The result is an estimated quantity. The associated numerical concentration or identification is an approximate concentration or identification, respectively of the reported analyte.
UJ	The non-detect result may be inaccurate or imprecise due to the quality of the data generated because certain calibration or QC criteria were not met.
R	The data are unusable. The sample results are rejected due to serious deficiencies.
X	Validator defined.

Reason Code	Reason Code Definition
MC	Reported concentrations or analyte identification may be inaccurate due to improper or infrequent scope alignment.
IC	Identification may be inaccurate due to improper or infrequent Refractive Index (RI) liquid calibrations.
B	The reported concentration may be inaccurate due to the presence of analyte structures/fibers in the associate contamination check or a contamination check was not performed daily.
SC	The reported concentration may be inaccurate due to the condition of samples upon receipt at the laboratory and/or improper storage prior to sample preparation and/or analysis.
ID	The asbestos identification and concentrations may be inaccurate because the recorded optical properties are not consistent with those described in the project-specific PLM SOPs and/or laboratory modification(s).

6.1.2 Data Package Inventory

Full Validation is required for all selected Libby PLM data. The required deliverables for full validation are summarized in the following table:

Level of Validation	Required Data
Full Validation	- Narrative - SAP Analytical Requirements Summary - Chain-of-Custody - EDD files - Raw Data (Bench Sheets) - Calibration Data (submitted on a quarterly basis) - Communication Records

6.1.2.1 Verify that the necessary components were submitted to perform a full validation.

6.1.2.2 All required data must be submitted by the laboratory in order for the validator to assess the validity and accuracy of the data package, which shall include complete hard copy and/or electronic deliverables. Calibration data are to be submitted on a quarterly basis.

6.2 SAMPLE RECEIPT

6.2.1 Review Items:

Traffic Report/Chain-of-Custody (TR/COC) records.

6.2.2 Objective:

The objective is to ascertain the validity of sample results based on the condition, packaging, and storage of the sample from time of collection to time of sample preparation and/or analysis.

6.2.3 Criteria:

Analyst inspection documentation must include verification that samples were properly packaged, sealed, are undamaged, and were labeled upon receipt at the laboratory.

6.2.4 Evaluation:

6.2.4.1 Verify that the TR/COC documentation indicates that the samples were received intact. Note in the Data Review Narrative if the samples were not packaged correctly, if there were any problems with the samples upon receipt, or if discrepancies in the sample condition could affect the data. Samples should never be wet. If the samples were received wet, verify that the laboratory contacted the client and dried the samples prior to analysis.

6.2.4.2 Verify that the information recorded on the COC records, shipping documents, and sample containers are complete and in agreement.

6.2.4.3 Verify that the COC records have been signed and dated.

6.2.5 Action:

Table 1. Sample Receipt Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Shipment and/or storage conditions are exceeded	Qualify as estimated (J)	Qualify as estimated (UJ)	SC	Affected Sample(s)
COC records incomplete and/or inaccurate.	Note in Validation Report	Note in Validation Report	NA	NA
COC records not signed and dated.	Note in Validation Report	Note in Validation Report	NA	NA

NA – Not Applicable

6.3 SAMPLE PREPARATION

6.3.1 Review Items:

Relevant SAP Analytical Requirement Summary, sample preparation documentation, TR/COC records, and Data Entry Form (EDD) and bench sheets.

6.3.2 Objective:

The objective is to determine from the review of the documents whether all samples were prepared, visual estimation procedures were applied and whether the applicable preparation procedures were applied.

6.3.3 Criteria:

Slide (sample) preparation consists of an initial examination by stereomicroscope and the preparation of random slide mounts from representative sub-samples of the original sample in the appropriate refractive index (RI) liquid.

6.3.4 Evaluation:

6.3.4.1 Verify that all samples listed on the COC for PLM analysis have been prepared for analysis.

6.3.4.2 Verify that the sample was examined by stereomicroscope to determine both homogeneity and a visual estimate of asbestos concentration.

6.3.4.3 Verify that the necessary gravimetric data, if applicable, have been recorded; refer to SOP SRC-Libby-01 (Current revision) for gravimetric requirements.

6.3.5 Action:

Table 2. Sample Preparation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Samples listed on the COC have not been prepared for analysis.	Note in Validation Report	Note in Validation Report	NA	NA
Sample was not examined by stereomicroscope to determine both homogeneity and a visual estimate of asbestos concentration.	Note in Validation Report	Note in Validation Report	NA	NA
The necessary gravimetric data, if applicable, have not been recorded.	Note in Validation Report	Note in Validation Report	NA	NA

NA – Not Applicable

6.4 MICROSCOPE ALIGNMENT

6.4.1 Review Items:

PLM alignment documentation (submitted by the laboratory on a quarterly basis), Data Entry Form (EDD), and bench sheets.

6.4.2 Objective:

The objective is to determine if the PLM instrument was aligned in accordance with the method procedure and frequency requirements. A properly aligned PLM is critical to ensure the instrument is capable of providing acceptable data.

6.4.3 Criteria:

The following alignment checks must be performed on a daily basis or when the microscope is determined to be out of alignment by the individual analyst, whichever is more frequent:

- Centering of the stage and objectives
- Centering the optic axis
- Adjusting of the iris diaphragm
- Alignment of lower polar
- Alignment of upper polar

6.4.4 Evaluation:

Review the provided PLM alignment records to verify the microscope was properly aligned on the day(s) on which the applicable samples were analyzed.

6.4.5 Action:

Table 3. Microscope Alignment Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Alignment not performed at the required frequency (daily).	Qualify as estimated (J)	Qualify as estimated (UJ)	MC	All samples analyzed on that date.

6.5 REFRACTIVE INDEX LIQUID CALIBRATION

6.5.1 Review Items:

Refractive Index (RI) liquid calibration records (submitted by the laboratory on a quarterly basis), Data Entry Form (EDD), and bench sheets.

6.5.2 Objective:

The objective is to determine whether proper calibration of the RI liquids was performed.

6.5.3 Criteria:

6.5.3.1 Each RI liquid used for routine sample preparation and analysis must be calibrated prior to use and monthly (weekly for NIOSH Method 9002) thereafter. Records of these calibration activities must be maintained.

6.5.3.2 The difference between the calibrated RI of the liquid and the original RI of the liquid must not be greater than 0.004. If the difference is greater than 0.004, the liquid may not be used for the analysis of the samples.

6.5.4 Evaluation:

6.5.4.1 Verify that each RI liquid used for routine sample preparation and analysis were calibrated prior to use and monthly (weekly for NIOSH Method 9002) thereafter.

6.5.4.2 Ensure the difference between the calibrated RI of the liquid and the original RI of the liquid is not greater than 0.004.

6.5.5 Action:

Table 4. Refractive Index Liquid Calibration Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
RI liquid calibration not performed at required frequency.	Qualify as estimated (J)	Qualify as estimated (UJ)	IC	All Samples
No RI liquid calibration performed or calibration failed criteria.	Qualify as estimated (J)	Qualify as estimated (UJ)	IC	All Samples

6.6 MINERAL/FIBER IDENTIFICATION CRITERIA

6.6.1 Review Items:

Data Entry Form (EDD) and bench sheets.

6.6.2 Objective:

The objective is to determine whether optical properties have been recorded for reported fibers. Positive asbestos identification requires the determination of the following optical properties:

- Habit
- Pleochroism
- Birefringence
- Angle of extinction
- Sign of elongation
- Refractive Indices (RI)

Asbestos cannot be reported in any quantity, including trace, until its optical properties have been measured and recorded.

6.6.3 Criteria:

The optical properties of fibrous material type(s) observed and recorded for PLM analysis must be consistent with those provided in Attachment 4, Optical Properties of Fibrous Amphiboles Associated with Libby Amphibole, of SOP SRC-LIBBY-03.

6.6.4 Evaluation:

6.6.4.1 For fibrous materials identified as asbestos, verify that the recorded optical properties are consistent with those provided in Attachment 4 of SOP SRC LIBBY-03.

6.6.4.2 When non-asbestos fibers are observed, verify that at least one optical property that distinguishes the fiber from asbestos is measured and recorded on the bench sheet.

6.6.4.3 LA Bin Categories – Using the Controlled LA reference slide mounts (0.2% and 1.0%) as a visual guide, evaluate the sample and verify that the reported LA results are consistent with those provided in Table 13.2 of SOP SRC LIBBY-03.

6.6.5 Action:

Table 5. Mineral/Fiber Identification Criteria Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
The recorded optical properties are not consistent with those of the asbestos type reported	Qualify as estimated (J)	No Action	ID	Affected Sample
Optical property not recorded for non-asbestos fibrous material	Qualify as unusable (R)	No Action	ID	Affected Sample
LA Bin Categories are not consistent with those provided in Table 13.2 of SOP SRC Libby-03.	Note in Validation Report	Note in Validation Report	NA	NA

NA - Not Applicable

6.7 CONTAMINATION CHECK

6.7.1 Review Items:

Data Entry Form (EDD), bench sheets, and calibration records (submitted by the laboratory on a quarterly basis).

6.7.2 Objective:

The objective is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities.

6.7.3 Criteria:

The following criteria for evaluation of blanks (contamination checks) associated with the samples:

6.7.3.1 Contamination checks (laboratory blanks) must be prepared and analyzed on a daily basis.

6.7.3.2 Asbestos fibers must not be detected in the associated contamination checks.

If problems with a blank exist, all associated data must be carefully evaluated to determine whether or not there is an inherent variability in the data, or if the problem is an isolated occurrence not affecting other data.

6.7.4 Evaluation:

6.7.4.1 Verify that the contamination checks are prepared and analyzed at the required frequency.

6.7.4.2 Verify that no asbestos was detected in the associated contamination checks.

6.7.5 Action:

Table 6. Contamination Check Analysis Evaluation Actions

Deficiency	Action		Reason Code	Samples Affected
	Detected Analyte	Non-Detect Analyte		
Contamination check not performed at the required frequency.	Qualify as estimated (J)	No action	B	Associated Samples
Asbestos fibers detected in contamination blank.	Qualify as estimated (J)	No action	B	Associated Samples

6.8 REFERENCE MATERIAL ANALYSIS (CALIBRATION STANDARDS)

Reference Material Analysis will be reviewed during the annual on-site audit.

6.9 LABORATORY DUPLICATES

Laboratory Duplicate Cross-check (LDC) Analysis and Laboratory Duplicate Self-check (LDS) Analysis are reviewed and evaluated on a program-wide basis. These analyses are reported in a separate QC Report. Qualification is not applied during the validation process; however, the QC samples reported with the sample set are listed in the validation report.

6.10 OVERALL ASSESSMENT OF DATA

6.10.1 Review Items:

Data package, narrative, SOP SRC-LIBBY-03 (current revision), Relative SAP Analytical Requirement Summary, and any communications from the data user that concern the intended use and desired quality of the data.

6.10.2 Objective:

The objective of the overall assessment of a data package is to provide a brief narrative of significant data reviewer comments, concerns, and opinions about the quality and usability of the data.

6.10.3 Criteria:

All method criteria apply.

6.10.4 Evaluation:

6.10.4.1 Review all available materials to assess the overall quality of the data, keeping in mind the additive nature of analytical problems.

6.10.4.2 Evaluate any technical problems that have not been previously addressed.

6.10.4.3 If appropriate information is available, the reviewer may assess the usability of the data to assist the data user in avoiding inappropriate application of the data.

6.10.5 Action:

6.10.5.1 Determine if there is any need to qualify data which were not already qualified based on criteria previously discussed.

6.11 REPORTING

6.11.1 Complete the current version of the Libby Asbestos data Validation template. Note for EPA action any inconsistencies with the data.

6.11.2 Any qualifiers assigned to the samples shall be entered into a spreadsheet which will be entered into the applicable data base (i.e. Scribe) by the database administrator.

7.0 QUALITY ASSURANCE

Apply secondary review to the deliverable as described in SOP QATS-70-006 (Secondary Review of Data Audit Reports).

8.0 CORRECTIVE ACTION

Corrective action should follow any event of nonconformance or noncompliance. Document nonconformances and corrective actions as specified in QATS QOP-14-01 and SOP QATS-20-018.

9.0 REFERENCES

9.1 SOP SRC-LIBBY-03 Analysis of Asbestos Fibers in Fine Soil by Polarized Light Microscopy, (current version)

9.2 SOP SRC-LIBBY-01 Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy, (current version)

9.3 National Environmental Laboratory Accreditation Committee (NELAC) Interim Standard for Asbestos Testing, (current version)

9.4 Method EPA 600/R93/116/July 1993, California Air Resources Board (CARB) Method 435) June 1991, and NIOSH Method 9002/August 1994

9.5 USEPA Analytical Services Branch (ASB) National Functional Guidelines for Asbestos Data Review, Draft August 2011

9.6 QATS QOP-14-01, "Corrective and Preventive Action"

9.7 SOP QATS-20-018, "Standard Operating Procedure for Nonconformance and Corrective Action"

9.8 SOP QATS-20-020, "Standard Operating Procedure for Controlling Documents and Forms"

9.9 SOP QATS-70-006, "Standard Operating Procedure for Secondary Review of Data Audit Reports"

9.10 Libby PLM Validation Checklist-QATS Form 70-094F001, current version

9.11 QATS Document Review Form-QATS Form 20-015F02, current version

STANDARD OPERATING PROCEDURE FOR THE VALIDATION OF LIBBY PHASE CONTRAST MICROSCOPY (PCM) DATA DELIVERABLES

APPROVED BY:

Originator	Date 6/19/13
Technical Reviewer (if applicable)	Date 6/21/13
QATS Quality Assurance Officer	Date 6/19/13
QATS Program Manager	Date 6/12/13
EPA Task Order Manager (if applicable)	Date 6/26/13
EPA Task Order Project Officer	Date 07/15/2013

RECORD OF SCHEDULED REVIEWS:

Date	Reviewed By	Date	Reviewed By
6/19/13			

CONTENTS

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) details the procedures for the validation of Phase Contrast Microscopy (PCM) data deliverables for air sample analysis. Although the National Institute for Occupational Safety and Health (NIOSH) Method 7400 is typically the method of choice for the analysis of asbestos and other fibers in air by PCM, and also the method considered during the development of this SOP, the procedures herein have been developed to accommodate various levels of project-specific requirements and modifications as documented in the applicable Sampling and Analysis Plans (SAP) Analytical Requirements Summary.

2.0 SUMMARY

2.1 The PCM method reliably assesses fiber exposure levels, but does not differentiate between asbestos and non-asbestos fibers. The PCM technique is specific for fibers, so that non-fibrous particles are excluded from the analysis. The analytical sensitivity for PCM is dependent on sample volume and the quantity of interfering dust.

2.2 A known volume of air is drawn through a 25-mm diameter cassette containing a mixed-cellulose ester (MCE) filter to capture airborne fibers. A wedge-shaped portion of the filter is removed, placed on a glass microscope slide and made transparent. Measured areas (fields) are viewed using a phase contrast microscope. The fibers meeting the defined criteria are counted, tallied, and used to calculate an estimate of the airborne fiber concentration.

2.3 A transcription check of the data is performed through comparison of the specified data elements in the submitted sample collection, electronic, and hard copy deliverables to ensure the accuracy of data entry and other transcription activities. Data validation is a thorough review of the deliverables for completeness, accuracy, and compliance with the applicable methodologies and requirements, and the recalculation of sample results. Unless otherwise specified, verification and validation is performed on 100% of the selected PCM deliverables. Both the transcription check and validation procedures are performed with the aid of a checklist, which is completed during the validation activities. Any discrepancies found during the transcription check are documented in the EDD/Bench Sheet Discrepancy Table of the Data Validation Report.

2.4 The procedures detailed herein conform to the QATS ISO 9001 Quality Management System (QMS) as described in the current QATS Quality Manual.

3.0 NOTES AND PRECAUTIONS

3.1 Chain-of-custody procedures must be maintained for each data package to ensure data integrity.

3.2 The hardcopy data package must be scanned into PDF format to ensure and maintain data integrity.

3.3 Security procedures must be maintained and applied to all EPA data from the time of receipt through release.

3.4 Use the current approved Data Review Checklist for the Validation of Libby PCM Data Deliverables to generate validation reports and attach the checklist to the validation report as an Appendix.

4.0 DEFINITIONS

4.1 ASBESTOS – The generic name for a group of naturally occurring mineral silicate fibers of the serpentine and amphibole series, displaying similar physical characteristics although differing in composition.

4.2 CONTROL CHART – A means to identify the degree to which a measured value disagrees with an accepted reference value.

4.3 LEVEL OF DETECTION (LOD) – The number of fibers necessary to be 95% certain that the result is greater than zero.

4.4 FIBER – An elongated particle, usually with substantially parallel sides, that is defined as having an aspect ratio of at least 3:1 and a minimum length of 5 µm.

4.5 FIELD – The area within the graticule circle that is superimposed on the microscope image.

4.6 WALTON-BECKETT GRATICULE – An eyepiece graticule specifically designed for fiber counting. It consists of a circle with a projected diameter of 100 ± 2 µm (area of about 0.00785 mm^2) with a crosshair having tic-marks at 3-µm intervals in one direction and 5-µm in the orthogonal direction.

5.0 MATERIALS

5.1 Personal Computer (PC) with latest available versions of appropriate client contract specified software for generating reports, printer, and accessories.

5.2 Any applicable project modifications which are listed in the SAP Analytical Requirements Summary.

6.0 PROCEDURES

This SOP describes the evaluation and validation of asbestos and other fibers in air by PCM.

6.1 DATA VALIDATION QUALIFIERS, REASON CODES, AND DATA PACKAGE INVENTORY

6.1.1 The data qualifiers in the following table are assigned to results in the hard copy data validation process. If additional qualifiers are used (i.e. X), a complete explanation of those qualifiers must accompany the data review.

Following the Data Qualifier table below is the Reason Code table. The reason codes are assigned to qualified results in the hard copy data validation process to explain the reason for the qualifier.

Data Qualifier	Qualifier Definition
J	The result is estimated. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The non-detect result may be inaccurate or imprecise due to the quality of the data generated because certain criteria were not met.
R	The data are unusable. The sample results are rejected due to serious deficiencies.
X	Validator defined.

Reason Code	Reason Code Definition
MC	Structure/fiber counts and reported concentrations may be inaccurate due to improper or infrequent scope alignment and/or magnification calibrations.
B	The reported concentration may be inaccurate due to the presence of analyte structures/fibers in the associate blanks (i.e. laboratory or field).
SC	The reported concentration may be inaccurate due to the condition of samples upon receipt at the laboratory and/or improper storage prior to sample preparation and/or analysis.
DL	The number of grid openings, fields of view or points counted/ analyzed is insufficient to meet the required limit of detection (LOD).

6.1.2 Data Package Inventory

Full Validation is required for all selected Libby PCM data. The required deliverables for full validation are summarized in the following table:

Level of Validation	Required Data
Full Validation	- Narrative - SAP Analytical Requirements Summary - Chain-of-Custody - EDD Files - Raw Data (Bench Sheets) - Calibration Data (submitted on a quarterly basis) - Communication Records

6.1.2.1 Verify that the necessary components were submitted to perform a full validation.

6.1.2.2 All required data reduction must be submitted by the laboratory in order for the validator to assess the validity and accuracy of the data package, which shall include complete hard copy and/or electronic deliverables. Calibration data are to be submitted on a quarterly basis.

6.2 SAMPLE RECEIPT

6.2.1 Review Items:

Traffic Report/Chain-of-Custody (TR/COC) records.

6.2.2 Objective:

The objective is to ascertain the validity of sample results based on the condition, packaging, and storage of the sample from time of collection to time of sample preparation and/or analysis.

6.2.3 Criteria:

Analyst inspection documentation must include verification that samples were not packaged in untreated polystyrene foam (peanuts), vermiculite, paper shreds, or excelsior packing materials; top covers and end plugs were in place for each cassette; and samples were properly sealed and undamaged; were neither shipped nor stored with bulk samples; and were labeled upon receipt at the laboratory.

6.2.4 Evaluation:

6.2.4.1 Verify that the TR/COC documentation indicates that the samples were received intact. Note in the Data Review Narrative if the samples were not packaged correctly, if there were any problems with the samples upon receipt, or if sample condition could affect the data.

6.2.4.2 Verify that the information recorded on the COC records, shipping documents, and sample containers are complete and in agreement.

6.2.4.3 Verify that the COC records have been signed and dated.

6.2.5 Action:

Table 1. Sample Receipt Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Cassette received damaged or not intact	Qualify as estimated (J)	Qualify as estimated (UJ)	SC	Affected sample
Samples packaged incorrectly (i.e., with vermiculite)				All samples in the shipment
COC records incomplete and/or inaccurate	Note in Validation Report	Note in Validation Report	NA	NA
COC records not signed and dated	Note in Validation Report	Note in Validation Report	NA	NA

NA – Not Applicable

6.3 SAMPLE PREPARATION

6.3.1 Review Items:

Relevant SAP Analytical Requirements Summary, sample preparation documentation, TR/COC records, Data Entry Form (EDD), and bench sheets.

6.3.2 Objective:

The objective is to determine from the review of the documents whether all sample filters subjected to preparation were intact, whether samples, were prepared for analysis using either the direct-transfer or the indirect-transfer procedure, and whether appropriate supporting preparation and communication documents are provided.

6.3.3 Criteria:

6.3.3.1 Filter samples must not be wet, punctured, contain loose debris or mishandled so as to disturb the fibers collected on the filter.

6.3.3.2 For filter samples which exhibit loading of ≥25% of the filter surface, use the uneven filter transfer preparation procedure. (MOD LB-000015).

6.3.4 Evaluation:

6.3.4.1 Review the sample preparation documentation and TR/COC records to verify that filter samples were not wet, punctured, or mishandled, and that all samples listed on the COC for PCM analysis have been prepared for analysis.

6.3.4.2 Verify that the indirect-transfer preparation procedure is applied to filter sample exhibiting loading of ≥25% of the filter surface, uneven filter loading, or the presence of loose dust or debris in the sampling cassette.

6.3.5 Action:

Table 2. Sample Preparation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Filter(s) damaged or compromised.	Qualify as unusable (R)	Qualify as unusable (R)	SC	Affected Sample
Required preparation procedure was not followed.	Qualify as estimated (J)	Qualify as estimated (UJ)	SC	Affected Sample

6.4 MICROSCOPE ALIGNMENT

6.4.1 Review Items:

PCM alignment documentation (submitted by the laboratory on a quarterly basis), Data Entry Form (EDD), and bench sheets.

6.4.2 Objective:

The objective is to determine if the PCM instrument was aligned in accordance with the method procedure and frequency requirements. A properly aligned PCM is critical to ensure the instrument is capable of providing acceptable data.

6.4.3 Criteria:

6.4.3.1 At least daily, the telescope ocular (or Bertrand lens, for some microscopes) supplied by the manufacturer must be used to ensure that the phase rings (annular diaphragm and phase-shifting elements) are concentric.

6.4.3.2 Using a Health & Safety Executive/National Physical Laboratory (HSE/NPL) test slide, the phase-shift detection limit of the microscope must be checked weekly for each analyst/microscope combination to ensure a minimum detectable fiber diameter of approximately 0.25 µm.

6.4.4 Evaluation:

6.4.4.1 Verify that the telescope ocular (or Bertrand lens for some microscopes) was used daily to ensure that the microscope phase rings are concentric.

6.4.4.2 Verify that the phase-shift detection limit of the microscope was checked weekly for each analyst/microscope combination.

6.4.5 Action:

Table 3. Microscope Alignment Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Phase ring concentricity not checked at required frequency.	Qualify as estimated (J)	Qualify as unusable (R)	MC	Affected Samples
Phase-shift detection limit not checked at required frequency.	Qualify as estimated (J)	Qualify as unusable (R)	MC	Affected Samples

6.5 INSTRUMENT CALIBRATION

6.5.1 Review Items:

Mechanical counter calibration documentation.

6.5.2 Objective:

The objective is to determine whether the counting device used to tally the fiber count was calibrated at the time of sample analysis.

6.5.3 Criteria:

The mechanical or tally counter calibration must be performed at least monthly.

6.5.4 Evaluation:

Verify that the mechanical or tally counter had been calibrated within a month of the sample analyses.

6.5.5 Action:

Table 4. Instrument Calibration Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Incomplete or failed calibration or not performed at the required frequency.	Qualify as estimated (J)	No action	MC	All Samples

6.6 ANALYTICAL SENSITIVITY/LOD

6.6.1 Review Items:

Data Entry Form (EDD).

6.6.2 Objective:

The objective is to determine whether the required graticule fields were analyzed to achieve the method LOD.

6.6.3 Criteria:

Method analytical sensitivity is one fiber, with an estimated LOD of 7 fibers/mm^2 of filter area, and an ideal counting range of 100 – 1300 fibers/mm^2. The analytical sensitivity in fibers/cc is dependent on the volume of air collected and the area of filter analyzed.

6.6.4 Evaluation:

6.6.4.1 Verify that the sample volume and the number of graticule fields analyzed were sufficient to provide the required analytical sensitivity in fibers/cc.

6.6.4.2 Verify that either 100 graticule fields have been analyzed or 100 fibers counted, with a minimum of 20 graticule fields analyzed.

6.6.5 Action:

Table 5. Analytical Sensitivity/LOD Evaluation Actions

Deficiency	Action		Reason Code	Samples Qualified
	Detected Analyte	Non-Detect Analyte		
Less than 20 graticule fields counted	Qualify as estimated (J)	Qualify as unusable (R)	DL	Affected Sample
Less than 100 graticule fields counted, with less than 100 fibers recorded	Qualify as estimated (J)	Qualify as unusable (R)	DL	Affected Sample

6.7 FIBER IDENTIFICATION CRITERIA

The PCM method does not provide for positive confirmation of asbestos fibers. Alternate differential counting techniques should be used if discrimination is required. Differential counting may include primary discrimination based on morphology, polarized light analysis of fibers, or modification of PCM data by Scanning Electron or Transmission Electron Microscopy.

6.8 FIELD BLANK ANALYSIS

Field blanks are reviewed and evaluated on a program-wide basis. Qualification is not applied during the validation process; however, the blanks reported with the sample set are listed in the validation report.

6.9 REFERENCE MATERIAL ANALYSIS

Reference Material Analysis will be reviewed during the annual on-site audit.

6.10 REPLICATE ANALYSIS

Replicate Analysis are reviewed and evaluated on a program-wide basis. These analyses are reported in a separate QC Report. Qualification is not applied during the validation process; however, the QC samples reported with the sample set are listed in the validation report.

6.11 OVERALL ASSESSMENT OF DATA

6.11.1 Review Items:

Data package, narrative; NIOSH Method 7400; Quality Assurance Project Plan (QAPP) [specifically, the Data Quality Objectives (DQOs)]; Sampling and Analysis Plan (SAP) Analytical Requirements Summary; and any communications from the data user that concern the intended use and desired quality of the data.

6.11.2 Objective:

The objective of the overall assessment of a data package is to provide a brief narrative of significant data reviewer comments, concerns, and opinions about the quality and usability of the data.

6.11.3 Criteria:

All method criteria apply.

6.11.4 Evaluation:

6.11.4.1 Review all available materials to assess the overall quality of the data, keeping in mind the additive nature of analytical problems.

6.11.4.2 Evaluate any technical problems that have not been previously addressed.

6.11.4.3 If appropriate information is available, the reviewer may assess the usability of the data to assist the data user in avoiding inappropriate application of the data.

6.11.5 Action:

6.11.5.1 Determine if there is any need to qualify data which were not already qualified based on criteria previously discussed.

6.12 REPORTING

6.12.1 Complete the current version of the Libby Asbestos Data Validation Report Template. Note for EPA action any inconsistencies with the data.

6.12.2 Any qualifiers assigned to the samples shall be entered into a spreadsheet which will be entered into the applicable database (i.e. Scribe) by the database administrator.

7.0 QUALITY ASSURANCE

Apply secondary review to the deliverable as described in SOP QATS-70-006 (Secondary Review of Data Audit Reports).

8.0 CORRECTIVE ACTION

Corrective action should follow any event of nonconformance or noncompliance. Document nonconformances and corrective actions as specified in QATS QOP-14-01 and SOP QATS-20-018.

9.0 REFERENCES

9.1 National Environmental Laboratory Accreditation Committee (NELAC) Interim Standard for Asbestos Testing, current version

9.2 NIOSH Method 7400, August 1994

9.3 QATS QOP-14-01, "Corrective and Preventive Action"

9.4 SOP QATS-20-018, "Standard Operating Procedure for Nonconformance and Corrective Action"

9.5 SOP QATS-20-020, "Standard Operating Procedure for Controlling Documents and Forms"

9.6 SOP QATS-70-006, "Standard Operating Procedure for Secondary Review of Data Audit Reports"

9.7 Libby PCM Validation Checklist-QATS Form 70-096F001, current version

9.8 QATS Document Review Form-QATS Form 20-015F02, current version

Appendix C

(REV 1) Analytical Requirements Summary Sheet (OU6BG0816)

QAPP ANALYTICAL REQUIREMENTS SUMMARY # OU6BG0816
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

SAP Title: Operable Unit 6 Confirmation Surface Soil Sampling
QAPP Date/Revision: August 8, 2016

EPA Technical Advisor: Dania Zinner (303-312-7122, Dania.Zinner@epa.gov)
(contact to advise on DQOs of QAPP related to preparation/analytical requirements)

Sampling Program Overview: The surface soil sampling program will consist of the collection of approximately one-hundred ninety one 30-point composite surface soil samples, nineteen field duplicate 30-point composite samples. Surface soil samples will be prepared and analyzed using PLM-VE and PLM-Grav methods. Approximately twenty four personal air samples will samples will be collected to evaluate Health and Safety procedures.

Index ID Prefix: BG

Medium-Specific TEM/PCM Preparation and Analytical Requirements for Field Samples:

Medium Code	Medium, Sample Type	Preparation Details				Analysis Details			Applicable Laboratory Modifications (c)
		Investigative? (a)	Indirect Prep? (a,b)		Filter Archive? (b)	Method(s)	Recording Rules	Analytical Sensitivity/ Stopping Rules	
			With Ashing (b)	Without Ashing (b)					
A	Health & Safety Personal Air	No	No	Yes [(b)], if material is overloaded (>25%) or unevenly loaded on filter	Yes	PCM – NIOSH 7400, Issue 2 TEM – AHERA (upon request)	For PCM: NIOSH 7400, "A" rules If AHERA is requested: All asbestos [(d)] L ≥ 0.5 µm AR ≥ 5:1	For PCM: Count until 100 fibers are detected. Stop at 100 FOVs regardless of count. For AHERA: Count until one is achieved: i) Target S = 0.005 cc-1, or ii) Evaluate a minimum filter area of 0.1 mm, or iii) 25 LA structures are enumerated (finish GO where 25th LA found)	For PCM: LB-000015 For AHERA: LB-000029, LB-000031, LB-000067, LB-000085, LB-000091

(a) See LB-000053 for additional details
(b) See most current version of EPA-LIBBY-08 for preparation details
(c) Use most recent versions of listed modifications
(d) Recording of chrysotile can stop after 25 chrysotile structures have been recorded (finish GO where 25th chrysotile structure found).

TEM/PCM Preparation and Analytical Requirements for Quality Control Samples:

Medium Code	Medium, Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications (c)
		Indirect Prep?		Filter Archive? (b)	Method(s)	Recording Rules	Stopping Rules	
		With Ashing (b)	Without Ashing (b)					
B	Air, Field Blank	No	No	Yes	PCM – NIOSH 7400, Issue 2	NIOSH 7400, "A" rules	Examine 100 FOVs	LB-000015

PLM Preparation and Analytical Requirements:

Medium Code	Medium, Sample Type	Preparation Method	Analysis Method	Applicable Laboratory Modifications
C	Soil	SOP 16-ASB-06.00	PLM-VE: SRC-Libby-03 Rev. 3 PLM-Grav: SRC-Libby-01 Rev. 3	LB-000073, LB-000088 LB-000097, LB-000098

Laboratory Quality Control Frequencies:

PLM: Lab Duplicate – 10% (cross-check 8%; self-check 2%)
Interlab – 1%

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	5/12/16	Draft Analytical Summary Development
1	8/8/16	Revised to include H&S personal air samples and associated QC samples

Analytical Laboratory Review Sign-off:

☐ ESATR8 – Troy [sign & date: _____]
☐ EMSL04 – Cinnaminson [sign & date: _____]
☐ EMSL22 – Denver [sign & date: _____]
☐ EMSL03 – Manhattan [sign & date: _____]
☐ RESI – Denver [sign & date: _____]
☐ ESATR8 - Golden [sign & date: _____]
☐ EMSL45 – Sierra Madre [sign & date: _____]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]

Appendix B

Detailed Data Quality Objectives

APPENDIX B

Detailed Data Quality Objectives

The DQO process, based on scientific methods, is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The DQOs presented in this section were developed in accordance with EPA guidance (EPA 2006).

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps include:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify tolerable limits on decision errors
7. Optimize the design

A.1 Step 1 – State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will be unambiguous.

BNSF Railway Company (BNSF) and the Lincoln County Port Authority (LCPA) are working together to improve rail access to the Stimson Spur in an effort to encourage development of the former Stimson Lumber property (Figure 1). According to information provided by LCPA, the West Leg of the Stimson Spur will be reconstructed and realigned to lessen track curvature. The proposed track alignment will intersect BNSF-owned property that has not been previously sampled, herein referred to as the Investigation Area. This investigation will be conducted to satisfy BNSF requirements for construction and lease development. While this investigation has not been requested by the EPA or DEQ, the sampling strategy and procedures will follow Libby-specific procedures and methodologies, adopted for application in OU6.

Physical cleanup of LA contaminated soils has been completed within OU6 by BNSF, specifically within the BNSF Libby Railyard, which is adjacent to the Investigation Area. Subsequent ABS investigations and confirmation soil sampling have been conducted in OU6 and support the conclusion that these removal actions were effective in mitigating LA exposures (CDM 2015, Section 8.2.3). Additional physical cleanups are not likely in OU6 unless the Transportation Corridor remedial action level (TC RAL) is exceeded. The TC RAL, applicable to OU6, is defined as an LA concentration of Bin C by polarized light microscopy - visual estimation (PLM-VE) and PLM-Gravimetric (PLM-Grav) (i.e., LA is present at levels greater than or equal to 1%) (EPA 2016).

Therefore, the two primary objectives of this test pit investigation are to:

1. Collect soil data to confirm the presence or absence of LA in the Investigation Area soils.

2. Compare LA concentrations in soil, collected as part of this test pit investigation, to the TC RAL, to determine if physical cleanup actions will be required prior to construction.

A.2 Step 2 – Identify the Decision

This step identifies what questions the investigation will attempt to resolve and what actions may result. The principal study questions and possible alternative actions are as follows:

Table A-1 Decision Statements

Response Item Evaluated	Principal Study Question	Alternative Actions
Evaluate concentration of LA present in soils	Is LA detected at levels greater than, or equal to the TC RAL in any soil sample collected in the Investigation Area?	• Document location of LA-contaminated soil for proper handling and disposal prior to construction • Take no action

Notes:

LA = Libby Amphibole asbestos
TC RAL = Transportation Corridor Remedial Action Level (LA soil concentrations of Bin C by PLM-VE/PLM-Grav, LA is present at levels greater than or equal to 1 percent).

A.3 Step 3 – Identify the Inputs to the Decision

The purpose of this step is to identify the information and measurements that need to be obtained to resolve the decision statements. The information needed to resolve the principal study questions are summarized in Table A-2.

Table A-2: Summary of Inputs to Resolve Study Questions and Use of Information Acquired from Inputs

Principal Study Question	Input to Resolve Question	Use of Input to Resolve Question
Is LA detected at levels greater than, or equal to the TC RAL in any soil sample collected in the Investigation Area?	Collection and analysis of composite soil samples from test pits	Two 30-point composite soil samples will be collected from the Investigation Area. The composite soil samples will be analyzed using PLM-VE and PLM-Grav methods, as applicable. The laboratory analytical results will be compared to the TC RAL to determine if physical cleanup actions will be required prior to construction.

Notes:

PLM – VE = Polarized Light Microscopy – Visual Estimation
PLM – Grav = Polarized Light Microscopy – Gravimetric

A.4 Step 4 – Define the Boundaries of the Study

This step specifies the spatial and temporal boundaries of this investigation.

A.4.1 Spatial Bounds

The information gathered to answer the study questions will be collected from the Investigation Area as shown on Figure 2 of the FSP.

As per the ROD (EPA 2016), the term “surface soil” is used to describe soil that would be encountered by human receptors under “typical” activities. “Typical” track construction activities are not likely to disturb soils to a depth greater than 36 inches below ground surface (bgs). Therefore, test pits will be excavated to 36 inches bgs. Asbestos concentrations in surface soil can be heterogeneous; therefore, it is important that soil sampling methods provide an even and representative coverage of the Investigation Area. To accomplish the goal of characterizing soils within the Investigation Area, each composite sample will consist of 30 individual aliquots.

A.4.2 Temporal Bounds

It is not thought that asbestos concentrations in soil are likely to be time-variable in its current environment. Thus the time of field sampling effort is primarily dependent upon ease of site access and sample collection (i.e., easier to collect soil samples in the summer than in the winter).

A.5 Step 5 – Develop Decision Rules

The purpose of this step is to describe the method that the EPA will use to assess whether the data collected indicate acceptance and the resulting decision applied when acceptance is not obtained. The principal study question, inputs to resolve study questions, action levels, and decision rules are summarized in Table A-3.

Table A-3: Decision Rules

Principal Study Question	Input to Resolve Question	Input Requirements	Action Level	Decision Rule
Is LA detected at levels greater than, or equal to the RAL in any soil sample collected within Investigation Area?	Collection and analysis of composite soil samples from test pits	Analysis: PLM-VE and PLM-Grav with project-specific modifications Reported Result: % LA AS: 0.2%	≥ TC RAL	If levels of LA ≥ TC RAL are detected in surface soil samples, physical cleanup of impacted soils will be conducted prior to construction activities If < TC RAL is detected, take no action.

Notes:

AS = Analytical Sensitivity

A.6 Step 6 – Specify Tolerable Limits on Decision Errors

The tolerable limits on decision errors, used to establish performance goals for the data collection design, are specified in this step.

Specific to performing this sampling investigation, two types of decision errors are possible:

A Type I (false negative) decision error would occur if a risk manager decides that a sample does not contain LA above a level of concern, when in fact it is of concern.

A Type II (false positive) decision error would occur if a risk manager decides that a sample does contain levels of LA above a level of concern, when in fact it does not.

The EPA is most concerned about guarding against the occurrence of Type I errors, since an error of this type may leave humans exposed to unacceptable levels of LA.

The EPA is also concerned with the probability of making Type II decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. Generally, the EPA allows for a 20 percent false positive rate.

For the purposes of completing all seven steps of the DQO process, the null hypotheses and consequences of making an incorrect decision are summarized in Table A-4. However, the gray region and tolerable limits on decision errors are not proposed because they are not applicable in this case.

Table A-4: Limits on Decision Errors

Principal Study Question	Null Hypothesis	Type I Error Will Result in:	Type II Error Will Result in:
Is LA detected at levels greater than, or equal to the RAL in any soil sample collected in the Investigation Area?	Soils are contaminated with LA at levels ≥TC RAL	Determining that soils are not contaminated with LA at levels ≥ TC RAL when they actually are. This may result in no subsequent exterior removal and in turn, an increased risk to human health.	Determining that soils are contaminated with LA at levels ≥ TC RAL when they actually are not. This would result in unnecessary corrective action and adds unnecessary costs and delays to the spur construction.

Typically, Step 6 of the DQO process is useful to encourage careful design of decision rules by defining and integrating the errors that are acceptable based upon a myriad of integrated project management decisions such as reduction in risk to human health, implementability/practicability, and cost. As stated in the guidance document for development of DQOs: QA/G-4 (EPA 2006), solely statistically generated tolerable limits on decision errors are not necessary in certain cases provided that a line of reasoning (scientific justification) is presented that adequately defines acceptable limits or decision errors. This particular effort was put forth in the *Record of Decision for Libby Asbestos Superfund Site – Operable Units 4 through 8* (EPA 2016) for DQOs for the following surface soil sampling.

A.7 Step 7 – Optimize the Design for Obtaining Data

This step identifies a resource-effective data collection design for generating data that are expected to satisfy the DQOs. The data collection design is described in detail in the remaining sections of this FSP and other site documents referenced in Section B.

Referencing the *Record of Decision for Libby Asbestos Superfund Site – Operable Units 4 through 8* (EPA 2016) and data previously generated for the Site, the DQOs have been designed to support the proposed activities and represent the best possible project planning effort. However, in implementing the requirements contained in this FSP, unforeseen situations may arise or team members may find more efficient means to carry out some of the day-to-day activities. Therefore, team members are always afforded the opportunity to recommend optimization of the data gathering design. Recommendations must come through proper channels [i.e., through the Field Team Leader (FTL)] and documented using either a Record of

Modification[1] to Documents Governing Field Activities form or an addendum to this FSP. All modifications or addendums must be approved prior to making the proposed changes.

[1] The current version of the field ROM form is provided in the OU6 eRoom; current versions of the Troy SPF and laboratory ROM forms are provided in the Libby Lab eRoom.

Appendix C

Analytical Requirements Summary Sheet (OU6BG0317)

FSP ANALYTICAL REQUIREMENTS SUMMARY # OU6BG0317
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

SAP Title: Stimson Spur Test Pit Soil Sampling
FSP Date/Revision: March 24, 2017

EPA Technical Advisor: Dania Zinner (303-312-7122, Dania.Zinner@epa.gov)
(contact to advise on DQOs of QAPP related to preparation/analytical requirements)

Sampling Program Overview: The test pit soil sampling program will consist of the collection of two 30-point composite soil samples and one field duplicate sample. Test pit soil samples will be prepared and analyzed using PLM-VE and PLM-Grav methods.

Index ID Prefix: BG

PLM Preparation and Analytical Requirements:

Medium Code	Medium, Sample Type	Preparation Method	Analysis Method	Applicable Laboratory Modifications
C	Soil	SOP 16-ASB-06.00	PLM-VE: SRC-Libby-03 Rev. 3 PLM-Grav: SRC-Libby-01 Rev. 3	LB-000073, LB-000088 LB-000097, LB-000098

Laboratory Quality Control Frequencies:
PLM: Lab Duplicate – 10% (cross-check 8%; self-check 2%)
Interlab – 1%

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	3/27/17	Draft Analytical Summary Development

Analytical Laboratory Review Sign-off:

☐ ESATR8 – Troy [sign & date: _____]
☐ EMSL04 – Cinnaminson [sign & date: _____]
☐ EMSL22 – Denver [sign & date: _____]
☐ EMSL03 – Manhattan [sign & date: _____]
☐ RESI – Denver [sign & date: _____]
☐ ESATR8 - Golden [sign & date: _____]
☐ EMSL45 – Sierra Madre [sign & date: _____]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]